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TO SKILL PERFORMANCE
IN TENNIS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

Karol Anne Kahrs, B.S.Ed., M.A.

The Ohio State University
1972

Approved by

[Signature]
Adviser
Department of Physical Education
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VITA

February 12, 1940 ................................................. Born - Baltimore, Maryland

1962 ................................................................. B.S.Ed., University of
Georgia, Athens, Georgia

1962-1964 ............................................................ Teacher Secondary Physical
Education, O'Keefe High
School, Atlanta, Georgia

1964-1965 ............................................................. Graduate Assistant,
Women's Physical Education
Department, The Ohio State
University, Columbus, Ohio

1965 ................................................................. M.A., The Ohio State
University, Columbus, Ohio

1965-1966 ............................................................ Teacher Secondary Physical
Education, O'Keefe High
School, Atlanta, Georgia

1966-1970 ............................................................. Instructor, Women's
Physical Education Depart-
ment, University of Illi-
nois, - Champain - Urbana, Illin
ois

1970-1972 ............................................................. Instructor, Women's
Physical Education Depart-
ment, Otterbein College,
Westerville, Ohio

PUBLICATIONS


FIELDS OF STUDY

Major Field: Physical Education. Professors Margaret A. Mordy, Delyte
Morris, and Barbara Nelson

Second Field: Teacher Preparation. Professor Charles M. Galloway
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CHAPTER I

INTRODUCTION

For many years physical educators have believed in the value of visual instruction. Demonstrations of skills and motor tasks have consistently characterized instructional methods. Teachers have provided demonstrations to aid learners in conceptualizing the total skill and in obtaining a visual picture or mental image of what the skill looks like. In light of this fact, it seems important to determine what that picture is and its relationship to skill performance. As teachers we have assumed that learners do develop a mental picture or image of a particular skill, and researchers have assumed that rehearsing the skill is beneficial to learning. Findings of research related to mental practice or mental rehearsal do support its significance in the learning process. Therefore, it is important that accurate mental images be developed if they are to be valuable. Gates, Oxendine, and Singer\(^1\) all agree that if demonstrations are to be helpful they must be correctly performed, observed with care, and clearly seen. Oxendine further suggests that "one is mentally rehearsing the skill being performed"\(^2\) by observing the performance of others. In light of this


\(^2\)Oxendine, op. cit., p. 222.
information, selected research dealing with mental practice has a direct relationship to this investigation which is concerned with mental image.

Research in recent years has investigated the role of mental practice or mental rehearsal in the learning of novel skills and sport skills. Although results and findings of this research support the use of mental practice in the learning process, to the best knowledge of the investigator, there has been no attempt made to determine the possible relationship between the mental image held by a performer of a particular skill and the physical performance of the same skill. Much of the research conducted in the area of mental practice has dealt with comparing the value of mental practice and physical practice. Investigations of this nature have employed a typical experimental design involving experimental and control groups.

Since previous research has not specifically attempted to determine the mental images of subjects, it might be said that it was assumed the subjects had a correct mental image or picture of the skill to be practiced. ("Correct" meaning the image was free of mistakes or errors.) However, this assumption is subject to question.

What constitutes the mental image and how that mental image relates to actual skill performance has not been investigated or determined. Therefore, this study was designed to explore whether or not one's mental image of a particular skill and the physical performance of that skill are comparable or if they differ, and if there is a relationship between mental image and actual skill performance.

Research involving the use of mental practice has incorporated reading material which describes and analyzes a particular skill, mentally
practicing a physical skill without the overt performance of that skill, and watching demonstrations of a skill and then mentally rehearsing that skill. However, to the knowledge of this investigator, no attempt has been made to determine exactly what mental image was used in the mental practice time. Further, no attempt has been made to provide the model of an expert demonstration whereby the subjects could watch the same performance repeatedly and as often or as few times as they wished.

**Statement of the Problem**

The purpose of this study was to investigate the relationship between mental image of the tennis forehand drive and actual performance of the skill by women students in beginning tennis classes and to determine the effect that developing a mental image of the skill would have upon skill performance.

**Hypothesis**

The general hypothesis of this study was that the more complete and detailed the mental image regarding essential elements of a particular skill, the more effective and efficient will be the performance of that skill.

This hypothesis stimulated the following additional questions for study.

1. Is the performer in the mental image (picture) that of the subject or someone else?

2. From what angle or position is the skill being performed? (Is the performer viewed from the side, the back, the front, from above, or from the perspective of the imaged performer?)
3. Is the skill being performed on the tennis court in relationship to the net and/or to the opponent? If not, what is a part of the mental image other than the performer executing the skill?

4. Is the mental image the same as or different than the subject's own physical performance of the skill? To what degree is there a difference? (To be answered after viewing one's own performance.)

5. Will providing the model of an expert skill performance change the mental image of an individual learning the skill?

6. If a positive change occurs in the mental image toward a more accurate and complete image of the skill, will a positive change also occur in the skill performance toward a more effective, more efficient performance?

7. Will there be any significant relationship between the change in mental image, skill performance, and proficiency in the skill?

Basic Assumptions Underlying This Study

1. Self reports of subjects will be accurate relative to their own mental image of the tennis forehand drive.

2. It is possible to assess mental image by using an Essential Elements Checklist for the Tennis Forehand Drive.

3. Subjects will be accurate in comparing their own mental images with self-performances of the tennis forehand, as recorded on videotape.

4. It is possible to improve one's mental image by viewing demonstration films of a particular skill if the performer is highly skilled.
5. It is possible to determine similarities and differences between self-reported mental image and skill performance by using an essential components checklist for the forehand drive in tennis.

Limitations

This study does not attempt to investigate all of the factors which might limit or enhance the development of one's mental image, therefore, the major factor discussed regarding the data collected will be focused upon the mental image assessment instruments and pertinent information regarding use of the demonstration films. Any influences obtained from the results of this study are applicable only to the population sampled. The mental image profiles obtained in this study were based upon the essential elements of good tennis form as determined by Dr. John Hendrix. It was assumed that these essential elements are those which are necessary to developing an effective and efficient forehand drive in tennis. Information revealed through the introspective analysis was considered to be accurately and honestly reported. It is recognized that the mental image profiles and the introspective analyses may not reveal all of the pertinent information that might possibly be obtained regarding one's mental image. This study was further limited by the fact that the judges who evaluated individual skill performances did not agree as to the order of importance of the elements essential to good tennis form.

Definition of Terms

1. **Accurate** - free from mistakes or errors; accurate image refers to an accurate, ideal model or picture that will produce an effective and efficient tennis forehand.

2. **Essential Elements Checklist** - a checklist devised by the investigator which is based upon the "Essential Elements of Good Tennis Form" as identified and described by John W. Hendrix. The checklist was validated by authority.
   a. A thrust through the ball
   b. Tuning in (visual concentration on the ball)
   c. Absence of tension
   d. Continual adjustment (racket-body-ball-alignment)
   e. Early backswing
   f. An efficient grip

3. **Introspective analysis** - the examination of one's own thoughts and feelings relative to the mental image each subject has of the tennis forehand.

4. **Mental image** - (picture) - used to signify the likeness, semblance, mental representation, or copy of the tennis forehand which a subject is able to bring to mind by the thought processes and her own senses.

5. **Mental practice** - used to signify the introspective or hidden rehearsal that takes place within the individual. This internalization may be in the form of reading about the skill, feeling the movements of

---

4Ibid.
the skill, watching demonstration films of an expert performance, thinking about the skill, or developing a mental image of the skill.

Significance of the Study

In view of the lack of research dealing with mental image, it seems important and appropriate to explore the ramifications of mental image and its components which can be identified and utilized in the teaching-learning process. Physical educators must not only recognize the mental aspects of skill learning and assist in the development of the mental image of particular skills, but they must attempt to identify and understand the mental images provided students. We can no longer assume that images are correct or that skills performed mentally are rehearsed correctly.

The research most pertinent to this study was conducted by DeBacy and reported in the Research Quarterly in March, 1970. DeBacy investigated the "Effect of Viewing Video Tapes of a Sport Skill Performed by Self and Others on Self-Assessment." Her study examined the accuracy of self-assessment of the golf swing by women students in beginning golf classes and the effectiveness of videotape replay in reducing any differences between actual and self-assessed skill. Two self-assessments, based on a scale using four models performances, were secured from each of the 63 volunteer subjects. The first self-assessments were determined by having the subjects compare their own swings as they pictured them to be, to those of the four models. Control subjects repeated


6 Ibid.
this procedure for their second self-assessment. Experimental subjects arrived at their second self-assessments after viewing a replay of their own swings and the model performances. The major finding was that self-viewing did improve the accuracy of self-assessment by 37 per cent. To the knowledge of the investigator DeBacy's research has been the closest attempt to determine the visual or mental picture of a subject relative to his actual performance.

There are several major differences which distinguish this study from the study cited.

1. This study is concerned with the assessment of one's own mental image as related to the performance of the skill involved.

2. An essential elements checklist has been devised to assess the mental image of the tennis forehand drive.

3. Videotape replay of performance will be provided each subject to allow for a self-comparison of her mental image and skill performance.

4. A profile of each subject's mental image and video-taped performances will be developed to facilitate the comparison of mental image and skill performance.

5. This study not only focused upon the relationship of the mental image and skill performance, but also upon the differences which might exist in mental images and skill performance.

The intent of this study was to compare personal mental image with personal skill performance, whereas, DeBacy's study compared personal skill performance with that of an impersonal skill model. From the analysis of DeBacy's data it was concluded "that the data lent support to the
general hypothesis that viewing one's self performing a sport skill will reduce any difference between self-assessed skill and actual skill.\(^7\)

The capacity to have a mental image implies that one is capable of bringing to mind a visual picture of a particular skill, such as stroking a tennis ball. According to Gates, "this is a capacity which we all possess, to more or less degree, and which an individual can develop. This capacity has a vital place in the learning of new movement skills."\(^8\) Therefore, this study was designed to explore various aspects of the mental image and its relationship to skill performance.

Realizing that all individuals are unique and respond differently to various stimuli, this study was designed to implement mental practice for subjects in a different manner than has been used previously. Subjects were not instructed to practice mentally a particular skill, but they were asked to watch a series of films to gain a better conceptualization and visual picture of a particular sport skill. The subjects were allowed to direct their own learning by using the films as many times as they were deemed helpful and to stop watching the films when they ceased to be beneficial. To explore implications of previous research findings dealing with mental practice, an expertly skilled performer was used in developing the films used in this study. The subjects were allowed to direct their own learning in relationship to the amount of time each spent in viewing the films. Each subject was encouraged to use as many or as few of the films, as much or as little, as she deemed

\(^7\) *Ibid.* , p. 31.
\(^8\) Alice Gates, *op. cit.*, p. 28.
appropriate. It is important to note that this study was not designed with the intention of providing a means by which to mentally practice the tennis forehand. It was designed with the intention of developing an accurate and/or detailed mental image of the forehand drive so that its relationship to skill performance might be investigated.
A review of the literature in the field of physical education does not reflect research findings dealing directly with mental image. This is not to imply that writers in the field have not discussed mental images, mental pictures, or mental visualizations. Research focusing specifically upon hypotheses exploring mental image however has not been reported. There have been numerous studies reported on mental practice which certainly have employed the use of mental images; however, investigators have limited their probing to the effects and values of various types of mental practice upon the learning of motor skills. In light of this fact, aspects of completed research related to mental image will be reviewed to provide a background and a basis for interpreting the results of this study, which was primarily concerned with mental image.

It seems appropriate to review selected research in the area of mental practice and/or mental imaging as one must have a mental image or mental picture of a particular skill in order to mentally practice the execution of that skill.

According to Richardson,

Primary interest in the process of mental practice has focused on its general value in facilitating the initial acquisition of a perceptual motor skill, in aiding the continued retention of such a skill, or in improving the immediate performance of a skill.¹

Jones' study is a good example of employing mental practice for learning a motor skill by having subjects read a mechanical analysis of the hook-swing upstart and then practicing the skill mentally. One experimental group of subjects in this study did not participate in any physical practice of the skill. At the conclusion of the study 56 percent of this group of subjects passed the skill test using the skill involved. Jones concluded that "the reception and interpretation and the formation of the kinesthetic image are the only essentials necessary in the initial learning of a gross body skill."^3

Another condition of mental practice which Jones employed in his research was a variation of the degree of direction which the subjects experienced in practicing the hook-swing upstart. Upon the basis of his results, Jones concluded that "undirected mental practice is superior to directed mental practice as a method of learning, both when mental practice is used in combination with physical practice."^4

Another approach to mental practice has been examined by Corbin.5 The purpose of Corbin's research was to test the effect of mental practice upon performance of a novel motor skill after subjects had been exposed to the real performance of the skill of juggling. Corbin concluded

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3Ibid., p. 275.

4Jones, op. cit., p. 275.

that "mental practice seemed to be better utilized when based on experience and when actual practice proceeded performance of the skill."

Another example of research in the area of mental practice which is interesting and which is different from the other investigations previously cited was conducted by Surburg. The purpose of this particular study was to compare the effectiveness of mental practice used in conjunction with visual, audio, and audio-visual instruction in the performance of the tennis forehand drive. Surburg's findings support those of Clark indicating that conceptualizing practice was an effective method of improving a gross motor skill. To be more specific, Surburg's findings indicated that "the most effective method of training was audio-mental practice." Surburg assumed that the audio-mental practice group probably engaged in more mental practice than did the audio-visual group because they first had to establish their own mental images. He further suggested that "both the visual and the audio-visual groups, having been provided images through the film strip of the tennis forehand drive, engaged in less mental practice, and therefore, profited less." It seems to this investigator that other variables may have influenced this statement. It is possible that the students who were subjects in the visual group and the audio-visual group may not have been as highly

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6 Ibid., p. 537.


8 Ibid., p. 728.

9 Surburg, op. cit., p. 733.

10 Ibid., p. 733.
motivated as the subjects in the audio-mental group or the subjects in these two groups may not have been motivated to respond to the treatment they experienced, or they might not have been able to identify with and/or accept the model provided in the film strip. In any case, this writer does not feel it is justified to conclude that these two treatment groups profited less because they engaged in less mental practice. The data of the research presented in this study does not provide support for that conclusion to be made. The research conducted by Jones,11 Start,12 and Surburg13 seems to be in agreement that in order for performance to develop and/or improve controlled imagery is necessary.

A more recent study dealing with mental practice, conducted by Schick14 in 1970, not only assessed the value of effectiveness of various time limits of mental rehearsal upon performance, but also investigated what one sees while engaging in mental practice. Schick asked the subjects in her study to describe what they saw when they were engaged in mental practice of the overhead serve and wall volley in volleyball. Schick was interested in determining if the student saw the skill being performed as if she were watching an entity which was separate from her own body, or if she saw only those body parts and surrounding areas which she would actually see if she were performing the skill. In describing

11 Jones, op. cit.
13 Surburg, op. cit.
the serve, the majority of subjects seemed to be watching themselves or
someone else in the form of a complete entity separate from their own
bodies. In describing the wall volley, the subjects described their
images in terms of only what one would see if they themselves were
actually performing the skill. Not only are Schick's findings interest­
ing, but they deserve serious consideration in terms of further research
designed to investigate mental imaging and mental practice.

It would seem important to know what a person's image is of a
particular skill before emphasizing practice utilizing that image as a
model. Secondly, it would seem essential to determine who the performer
is in the image and how that image is perceived -- in total or in part.
It would seem reasonable that practice with a total image or a partial
image would have very different and results in developing and/or improv­
ing a particular skill performance. It is entirely possible that future
research needs to determine what aspects of a person's mental image are
missing or are not clear so that measures could be taken to determine
how to assist that individual in formulating or conceptualizing a com­
plete and accurate mental image.

From the research reviewed it seems it has been established that
mental practice is effective in motor learning, but the question one
might raise is, how can it be more effectively employed? To answer that
question, the details of mental images or mental pictures of particular
skills must be determined, and then, as physical educators, we must find
methods and techniques of bringing these images into sharp, clear focus
so that they might be used to the best advantage. Oxendine suggests that
one means of helping students gain a clearer concept of the correct
performance of a particular skill is by "observing outstanding participants in action or by watching a demonstration film."\textsuperscript{15}

A research study which seems to support Oxendine's statement was conducted by Nelson.\textsuperscript{16} Nelson's study was designed to determine the effectiveness of slow motion loop film on the learning of the golf swing. The experimental group in Nelson's study had the advantage of watching slow motion loop films of the golf swing at the beginning of each class and midway through each class. In addition, the subjects received individualized instruction during the film showing and were assisted with what should be observed in the filmed performance. The control group also had individualized instruction, but did not have the experience of watching the loop films. On the basis of the results of Nelson's study he concluded that "... the loop films are beneficial to the more skilled in the later stages of learning and the less skilled in the early stages."\textsuperscript{17}

Research conducted by Watkins\textsuperscript{18} using motion pictures of baseball players batting skills agrees somewhat with the findings of Nelson. Watkins showed subjects in his study motion pictures of their batting skills in an effort to determine if this was an effective technique in reducing batting faults. Watkins findings seem to warrant the conclusion that

\textsuperscript{15} Oxendine, op. cit., p. 238.


\textsuperscript{17} Ibid., p. 43.

"baseball players who view motion pictures of their batting can significantly decrease the number of their batting faults as compared to baseball players who do not view motion pictures of their batting." Watkins also indicated that "the use of motion pictures tends to be more valuable at the beginning than during any other time of a learning period." Watkins supported the use of motion picture films as being valuable at the beginning of the learning period. A fact that should be recognized, however, is that the subjects in his study were college varsity baseball players. This fact would indicate that the subjects were beyond the beginning skill level and could be considered to be more skilled. Taking this information into account, one might conclude that Watkins's research findings do agree with Nelson's in regard to motion pictures being valuable to the more skilled in later learning stages.

Another means of providing information about personal skills as well as model performer skills has been through the use of the videotape recorder and instant play-back. DeBacy employed the use of the videotape recorder to determine the effect of seeing a sport skill performed by self and others upon self assessment. Each subject in DeBacy's research hit four golf balls off of an imitation grass inlay into a hitting cage while being videotaped. Following the taped performance, each subject viewed the videotaped performance of four model performers ranging in skill ability, and established a self assessment score by

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19 Ibid., p. 228.
21 DeBacy, op. cit.
comparing her swing, as she mentally pictured it to be, to the models' golf swings. Following the second videotaped performance the subjects in the experimental group viewed their own skill performance prior to viewing the videotaped performances of the four model performers. These subjects then arrived at a second self-assessment score. From the analysis of the data presented in conjunction with the major hypothesis, "it was concluded that the data lent support to the general hypothesis that viewing oneself performing a sport skill will reduce any difference between self-assessed skill and actual skill."²²

DeBacy assumed all subjects in her study pictured themselves in their mental image of the golf swing, and this assumption appears to be in agreement with other research concerned with mental practice. However, subjects were not asked if they did actually see themselves performing the golf swing and the data do not indicate whether there were subjects who did not see themselves as the performer in their mental image. A question that one might raise is, if a subject did not see herself in her image, how accurate could the self-assessment of her swing be? Another point which might be brought out is the angle from which the filming took place during the videotaping and the angle from which a subject's mental image was visualized. If the videotaping angle and the mental visualization angle were not the same, it would appear that an accurate comparison of the swings would be very difficult if not almost impossible. For example, if the mental image were viewed from the front and the actual performance were filmed from the back on a diagonal of

²²Ibid., p. 29.
55 degrees, the perception of the swing would be entirely different than that of the mental image; therefore, an accurate comparison of the image and actual swing would be less likely to occur.

It is apparent from the review of selected literature for this study that many questions concerning mental images or mental pictures remain to be answered and explored. Researchers have not attacked the problems nor explored the potentialities of mental image in sufficient depth due to the illusiveness of the area of mental image and the difficulty involved in trying to determine what is inside the mind's eye. However, if mental practice or mental rehearsal is to be truly effective and if it is to have meaningful end results, physical educators must explore means of determining mental images of particular sport skills. In so doing, the learning of motor skills might be greatly facilitated and success of students performing sport skills could be enhanced.
CHAPTER III

PROCEDURES OF THE STUDY

The primary purpose of this study was to investigate the relationship of one's mental image of the forehand drive in tennis to the quality of skill performance demonstrated in executing the same skill. A secondary purpose of the study was to make a comparison of mental image and actual skill performance to determine if they were the same or different. To achieve these purposes, the following procedures were adopted.

Selection of Subjects

Twenty-four women students at Otterbein College who were enrolled in the two year required physical education service program participated in this study. They had elected to take beginning tennis during the fall term 1971. The subjects who participated in the study were selected by chance from a sample of thirty-eight students who volunteered and expressed an interest in being involved in a research project dealing with tennis.

In order to be selected for participation in this study, subjects had to meet the following criteria:

1. All subjects had to be right-handed.

2. All subjects had to express an interest in tennis and express a desire to learn the game and/or improve game skills.
3. All subjects had to fall within a range of past instructional experience ranging from none through eight weeks of instruction.

The above criteria were applied to the selection of subjects for this study for the following reasons. Subjects had to be right-handed because the expert performer selected as the model for the demonstration films used in the study was right-handed. It was therefore assumed by the investigator that right-handedness was a variable which should be controlled. Due to the nature of this investigation and the results of previous research on mental practice, the investigator thought it important that subjects be motivated to participate in the research. "A high level of motivation is essential for optimal benefits in learning to occur."1 Subjects had to fall within a range of instructional experience from none to not more than eight weeks of instruction so that mental images and actual skill performances in various stages of development would be available for investigation.

All subjects who participated in this study completed a Participation Information Inventory prior to being selected. The inventory was completed by sixty-four students and thirty-eight were identified who met the criteria. From these thirty-eight students twenty-four students were selected by chance by drawing their inventories at random from a box. For details regarding the Participation Inventory, refer to the Appendix G.

Development of Instruments

Since instruments designed to assess mental images of sport skills did not exist, this investigator designed three instruments to accomplish

1Oxendine, op. cit., p. 239.
this task. Two of the instruments were constructed to determine individual characteristics and aspects of mental image and were called Introspective Analysis I and Introspective Analysis II. The other instrument was designed to deal primarily with the essential elements of the forehand drive. This instrument hereafter, will be referred to as the Essential Elements Checklist for the Forehand Drive. Refer to Appendix C.

Several other instruments were designed for the purpose of this study. These instruments included: Evaluation of the Essential Elements Checklist, Subjects Performance Score Record Sheet, Judges Ratings Sheet, Demonstration Films, and a use of Film Record Sheet. These instruments will be discussed in detail in this chapter.

Mental Image Instruments

In developing the Essential Elements Checklist several sources of data in the area of tennis were consulted. Since quality of performance of the forehand drive needed to be assessed, authorities in tennis who have addressed themselves to describing good form received the greatest attention. Driver, Hendrix, and Barnaby stress good form and are in agreement as to what constitutes good form in tennis. All three authorities agree upon hitting through the ball or a thrust through the ball, an efficient grip, continual adjustment to the ball, early backswing in preparation for the shot, and tuning in or watching the ball as being

3John W. Hendrix, op. cit.
4John M. Barnaby, Racquet Work: The Key to Tennis (Boston: Allyn and Bacon, 1969).
essential to good form in tennis. Barnaby stresses the teaching of the Eastern grip to beginners and he is more specific as to details which should be present in the continual adjustment of a player to the ball. Hendrix also stresses the importance of being free of tension.\(^5\) Barnaby\(^6\) and Driver\(^7\) imply this quality in using descriptive terms such as smooth, efficient, forceful, powerful, and stressing sound mechanics.

Upon the basis of agreement of the tennis authorities cited development of an Essential Elements Checklist was deemed to be feasible. The primary source of information used for the design of the instrument was an article entitled "Essential Elements of Good Tennis Form" written by John W. Hendrix.\(^8\) Questions were constructed to determine the elements which were a part of a subject's mental image of the forehand drive. The questions and possible responses were developed in checklist form to facilitate recording of the responses by the investigator.

In order to assess pertinent information concerning individual characteristics of one's mental image of the forehand drive two introspective analyses were designed. These instruments were constructed to provide information about mental image which would not be revealed by the Essential Elements Checklist. The questions designed for these instruments were constructed to determine personal characteristics of each subject's mental image, thereby, affording the investigator more concrete facts or details about the mental image visualized by each subject. The

\(^5\)Hendrix, op. cit., p. 18.
\(^6\)Barnaby, op. cit., p. 95.
\(^7\)Driver, op. cit., pp. 20, 23, 35.
\(^8\)Hendrix, op. cit.
questions for the Introspective Analysis I and II were developed in a sequence which the investigator assumed to be logical and appropriate. The first question asked of each subject was to identify the performer in her mental image. This procedure was followed so that all following questions could be phrased in terms of the conceptualized mental image. The investigator believed that if subjects were to give honest, accurate responses to questions regarding their mental images, the questions must be geared to the subject's own perspective of the mental image of the forehand drive. The introspective analyses were designed in checklist form to facilitate the recording of each subject's responses to the questions asked.

Since this study was conducted to explore aspects of mental image of a sport skill, the treatment of subjects was designed to help subjects develop a more complete, accurate mental image of the forehand drive. In view of this fact, the Introspective Analysis I and II were constructed to assess existing or initial mental image, as well as changes that might occur as a result of participating in this investigation. To prevent subjects from identifying the primary purpose of the study, supplementary or distracting questions were added to the instruments. These questions pertained to the study, but they were not considered to be essential or of primary interest to the investigator. A complete compilation of all questions comprising the Introspective Analysis I and II are located in Appendix C.

Other Instruments

An evaluation form (refer to Appendix D) was constructed to assess the agreement of selected judges, considered to be authorities in
tennis, regarding the essential elements to be included in the check-
list. The purpose of this form was to validate the instrument. The 
Judge's Evaluation Form also served the purpose of soliciting recommenda-
tions for changes regarding the questions designed to assess subjects' 
mental images relative to the six essential elements of the forehand 
drive.

Judges selected to evaluate the Essential Elements Checklist were 
chosen on the basis of their teaching and/or coaching experience and 
knowledge of tennis. A brief description of the qualifications of each 
judge is found in Appendix I.

A Skill Performance Record Sheet was developed to record the 
success and effectiveness of shots performed during the videotape per-
formance of each subject. The purpose of the actual skill performance 
record sheet was to allow the investigator to determine the number of 
successful shots executed during the videotape performance. This in-
formation also allowed the investigator to know the placement of shots 
on the court and provided information about unsuccessful shots as well 
so that a composite performance score might be established. A sample of 
the Skill Performance Record sheet is located in Appendix F.

A Judges Rating Form was constructed to allow judges to record 
their ratings of subjects performances viewed via videotape. This rating 
form included the criteria to be considered in evaluating performances 
and indicated the scale, 0 - 50 to be used. A Judges Rating Form was 
used by each judge during each viewing of the videotape and all ratings 
for a viewing were recorded on one form.
Development of Demonstration Films

To provide subjects with an expert demonstration of the tennis forehand, an expert performer was selected as a model for the demonstration films. The model selected was Dr. Mary Slaughter, who is currently the teaching pro at the Twin Town Tennis Center in Champaign, Illinois. Dr. Slaughter has also been a nationally ranked player.

Realizing that subjects might be at different stages of development of their mental images of the forehand drive, the investigator felt it important to film the actual performance of the model performer from several different vantage points or angles. Clark's research employed a 90 degree angle partially facing the subject and a 45 degree angle partially facing the subject. DeBacy filmed her subjects from a 55 degree angle. Clark's findings indicated that the films were beneficial to his subjects in learning a sport skill; therefore, this investigator assumed these vantage points would be appropriate to include in this study. In addition, several other filming positions were selected for inclusion in this investigation.

The model performer was filmed from a 90 degree angle to the line of flight of the ball, a 45 degree angle to the line of flight of the ball, directly in front of the performer, a 45 degree angle from above (the filming was done from a roof adjacent to the court which was 16 feet above court level), behind the performer directly in line with the flight of the ball. Another film was also made of the expert performer

9Clark, op. cit., p. 38.
10DeBacy, op. cit., Appendix A.
participating in a rally to place the skill in its proper perspective in relation to the total game.

The model performer was filmed from each of the vantage points cited for a series of fifteen shots. This gave the investigator enough shots to edit the films and splice out shots that were not acceptable. The editing process resulted in six films for use in the study that showed good form, and provided a minimum of ten shots that could be viewed repeatedly from each vantage point.

Another procedure that was followed during the filming process was the use of a target on the court. This target was located to the right of the center of the backcourt area. The target was used to insure consistent placement of the ball for the performer. A Ball-Boy machine was used to project each ball into the target during the filming of all shots from all vantage points. These procedures were followed so that the films would be as similar as possible to videotaped performances of the subjects participating in the study. The investigator assumed that keeping these particular variables constant might enhance the reliability of the comparison of one's mental image of the forehand drive with her actual performance of the skill. It was also felt that this procedure might facilitate subjects identifying with the model in the demonstration films. For exact locations of the filming positions used for the model performer and subjects refer to the diagram of equipment and facilities in Appendix B.
Film Record Sheet

A Film Record Sheet was developed to determine the usage made of films during the study. Each film was identified by vantage point and space provided for each viewing to be recorded. See Appendix H.

Equipment and Facilities

The camera used to make the demonstration films was an Argus Cosina Super 8 with a zoom lens. The film used was Kodachrome Super 8 color movie film. All of the demonstration films were filmed by August Zurner of Urbana, Illinois, at the Twin Town Tennis Center in Champaign, Illinois.

The movie projector used to view the films was a Kodak 120 Ektographic Super 8 Cartridge Projector. All films were enclosed in Super 8 Cartridge B (D523) cartridges. Four Super 8 Kodak 120 Ektographic Projectors were available for use throughout the study. This particular movie projector was selected because of the following features:

1. Threading of the machine and rewinding of the films was completely automatic.
2. The films could be viewed without being touched or handled in any way as they were contained in individual cartridges. This feature maintained the quality of the films.
3. The films could be viewed at natural speed, slow motion, or stop action.
4. Each film could be viewed as many times as desired by the subjects without ever removing the cartridge from the projector.

The videotape deck and playback unit used in this study was the Shibaden Videotape Recorder SV-700. Shibaden videotape was used for all videotaped performances. A Bell and Howell Port-a-Pak Camera 050582 with a Fujinon lens TV 2-1:2 14-70 Viz-10 was used to film all subjects.
performances of the forehand drive. The monitor used for all playback viewing was a Motorola television with a 12 inch viewing screen which had been converted to an Apex monitor, VM9A. This part of the playback unit provided audio as well as visual feedback of each subject's performance of the forehand drive.

Tennis courts at Otterbein College were available for use during the videotaping sessions for all skill performances of subjects. The same courts were used by the subjects during class instruction and for any additional practice or leisure time use.

All of the videotaping equipment and the four Kodak Ektagraphic Super 8 Projectors were made available by the Learning Resource Center at Otterbein College. In addition to making the above equipment available for this investigation, the Learning Resource Center housed the demonstration films and facilitated their use by the subjects involved in this study. The Learning Resource Center was open Monday through Friday from 8:30 A.M. to 10:30 P.M. and Saturday and Sunday from 8:30 A.M. to 5:00 P.M. Private viewing stations were made available for use for each individual subject desiring to use the films. Subjects could view the films individually or in small groups. A record was kept for frequency of viewing by every subject.

**Pilot Study**

Prior to the conduct of this investigation, a pilot study was undertaken to test the instruments designed to assess mental image relative to the forehand drive in tennis. The interview technique was used to administer the Introspective Analysis I and the Essential Elements Checklist to ten volunteer subjects who were enrolled in beginning tennis
classes at the University of Illinois in Champaign - Urbana. The purpose of the pilot study was to refine interview techniques and to determine the effectiveness and clarity of the questions incorporated in the two instruments. The data collected through the pilot study were used only for the refinement of the instruments.

Treatment of the Subjects

The investigator met with all selected subjects to explain the nature of their involvement in the project. All subjects were given printed material explaining the study and the procedures to be followed. Subjects were encouraged to ask questions about any aspect of the study which they did not understand. Instructions regarding the interview sessions, the videotaping sessions, and the viewing of the demonstration films were explained in detail. During this orientation meeting subjects were given the opportunity to change their mind about participating in the study if they felt for any reason they could not devote the time necessary to be involved. The investigator felt that subjects should be given this choice since the scope of the study was not known to those who had volunteered their involvement until this time. All subjects indicated a desire to continue their participation in the study. Instructions given to the subjects at the orientation meeting are found in Appendix A.

The subjects involved in this investigation included a range of previous instruction that varied from no instruction to eight weeks of instruction. Subjects with the most previous instruction were instructed to sign up for the first interview and videotaping times. It was believed that those subjects with no previous instruction should be allowed sufficient time to develop a mental image of the forehand drive before
being interviewed and videotaped. Therefore, as much as individual
schedules permitted, subjects with the greatest amount of previous in-
struction were scheduled first.

To attempt to determine the mental image of the tennis forehand
drive, each subject was interviewed relevant to her present mental pic-
ture as she could reveal it to the investigator via self-report and
introspective analysis. The initial interview of all subjects was con-
ducted during the second and third weeks of the ten week instructional
term. Each interview lasted approximately fifteen to twenty minutes.
The interview incorporated the use of both the Essential Elements Check-
list and the Introspective Analysis I. The investigator chose to use
the interview technique rather than a questionnaire to obtain informa-
tion pertinent to the investigation. Subjects were encouraged to indi-
cate any difficulty in understanding any of the questions. It was the
judgement of the investigator that honest and accurate answers to the
questions posed could only be provided if subjects truly understood the
questions. Use of the interview technique also allowed unsolicited in-
formation regarding a subject's mental image of the skill to be recorded.
Further, some subjects found it necessary to communicate responses to
some questions by demonstration rather than by verbalization alone. Some
responses could not be verbalized, but they could be shown or acted out.
Demonstrations often revealed where the racquet was positioned according
to the mental image. For example, if a subject held the racquet in the
position where it was during ball contact, the investigator could deter-
mine if the ball was being played slightly in front of the body, even
with the center of the body, or behind the body. In some cases the grip visualized was also demonstrated rather than being verbalized.

On occasion the subject used a diagram of a tennis court to show the vantage point of their mental image. Paper and pencil responses would not have allowed all information gained in the interview to be recorded for use by the investigator.

It is important to note the technique of questioning which was employed in each interview. Each subject was encouraged to respond to all questions with her own personal thoughts, reactions, and beliefs as no question posed had a correct or incorrect response. To insure confidence in this fact, the investigator phrased all questions in a context which represented each subject's personal perspective of her mental image of the forehand drive. This task was accomplished by initially asking each subject to identify the performer in her mental image. All following questions were asked in the frame of reference possessed by each subject.

Following the interview each subject's performance of the forehand drive was videotaped. Subjects were allowed as much warm-up time as necessary to become adjusted to the filming situation. Each subject practiced with the Ball-Boy machine on the court where the taped performance would occur. When each subject was comfortable using the machine and stroking balls that were projected into the target area on the court, the actual filming was done. Subjects were filmed for a series of ten shots. A shot was not counted unless the ball was played from the target area.
Immediately following the videotaping, each subject viewed her own playback and was asked to compare her performance with that of her mental image. This comparison was made to determine if the mental image and the actual performance were of the same quality or if they were different. If the comparison revealed a difference, the subject was asked which performance was better and to what degree was it better. This information was recorded as part of the subject's Introspective Analysis I, and this procedure completed the first phase of the study for all subjects.

The second phase of the study required subjects to view six demonstration films of the expert performer executing the forehand drive a minimum of ten target shots. Subjects were instructed to view the films a minimum of one time each or as many times as they believed the films to be beneficial to them. Subjects were also instructed to keep a record of how many times they used each of the films. In addition, the use of other resource materials was encouraged. Each subject had a personal copy of John Hendrix's article "Essential Elements of Good Tennis Form" and was encouraged to read it.

One month after actual participation in the study, all subjects received a letter from the investigator reminding them of the resources available to them in the Learning Resource Center and in the Physical Education Library. At this time subjects were encouraged to continue their independent study and viewing of the demonstration films. Subjects were also reminded of the time to complete their own viewing of the films so that all final interviews and videotaping sessions could be completed before the term ended.
During the ninth and tenth weeks of the ten week term, all subjects were reinterviewed and revidetaped. The same procedures and techniques as were employed in the first phase of the study were adhered to during the final interview and videotaped performances. The only difference between the first interview and the second interview was the use of Introspective Analysis II. This instrument included all of the same questions as Introspective Analysis I, but also included additional questions which would indicate any change in a subject's mental image of the forehand drive and possible reasons which might have induced such change.

The three judges who initially evaluated the Essential Elements Checklist were used to rate each subject's videotape performance of the tennis forehand. It was decided by mutual agreement of the judges to evaluate each performance on a rating scale of 0 - 50 using the criteria of the Essential Elements Checklist as a standard for performance assessment. To have a frame of reference as to the quality of standard expected by each judge, it was mutually agreed upon that the model that might receive a perfect score would be a top-ranked professional player who will remain unnamed. It was assumed that no subject would exhibit such a performance and therefore, all subjects would be able to be evaluated on this scale.

Each judge viewed each videotape performance twice and rated the performance for each subject during each viewing. There was a minimum of ten days between the first and second viewing of the videotaped performances of the subjects.

During the viewing of a taped performance each judge rated the skill performance of each subject and recorded an assessment on a Judges
Rating Evaluation Form. Each judge viewed the taped performance independent of the other judges, with the exception of the last viewing of the second performance. During that viewing two judges assessed the tapes concurrently to facilitate their individual time schedules.

After all of the judges' ratings were tabulated, they were correlated to determine inter-judge and intra-judge reliability of the ratings. The Kendall Coefficient of Concordance was applied to the judges ratings to determine the degree of agreement among the judges ratings. See Tables 1, 2, and 3.

The procedure that was followed for this study is outlined below.

Subjects \( N = 24 \)

1. s interviewed to establish mental image profile and filming vantage point

2. s warm-up and hits a series of 10 target shots while being videotaped

3. s views own physical performance of the forehand drive and makes a comparison to her mental image of the same skill

4. s views demonstration films and has an opportunity to take advantage of using other resources in the area of tennis

5. s are re-interviewed to establish if changes, if any, have occurred in the mental image profile and vantage point from which the mental image is visualized

6. s warms up and hits a series of ten target shots while being videotaped

7. s views own physical performance of the forehand drive and makes a comparison to her mental image of the same skill

8. Judges rate skill performance of each subject's tennis forehand using a scale of 0 - 50. Judges rate both performances of the subjects two times.
CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

Introduction

The purpose of this investigation was to explore the relationship between mental image of the forehand drive in tennis and skill performance of the same skill. The study was designed to examine the comparison of mental image and skill performance to determine if they were the same or different.

Components of each subject's mental image were determined by the Introspective Analysis I and II and the Essential Elements Checklist. Each subject's performance of the forehand drive was recorded on videotape so her mental image could be compared with her own performance. In addition, a record of successful shots was kept for each videotape performance. The subjects' skill performances were rated by three judges to determine the quality of performance based upon the criteria established in the Essential Elements Checklist.

The data for this study which could be programmed were processed by the Data Processing Center at Otterbein College. These data included correlations between and among judges' ratings, improvement scores, film viewing frequencies to determine if relationships were significant.

The statistical tool employed to correlate the judges' ratings was the Pearson Product Moment Correlation.¹ This was applied to the

judges' ratings to determine the reliability of ratings within each judge and between judges' ratings. All of the within judge correlations were significant at the .01 level of confidence. All of the between judge correlations, with the exception of one, were significant at the .05 or .01 level of confidence. Actual correlations can be located in Tables 1 and 2.

### TABLE 1

**SUMMARY OF PEARSON PRODUCT MOMENT CORRELATIONS FOR WITHIN JUDGE RATINGS**

<table>
<thead>
<tr>
<th>Judge and Viewing</th>
<th>Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tape I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 - A2</td>
<td>.7321</td>
<td>.01</td>
</tr>
<tr>
<td>B1 - B2</td>
<td>.8355</td>
<td>.01</td>
</tr>
<tr>
<td>C1 - C2</td>
<td>.8556</td>
<td>.01</td>
</tr>
<tr>
<td>Tape II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 - A2</td>
<td>.6460</td>
<td>.01</td>
</tr>
<tr>
<td>B1 - B2</td>
<td>.5645</td>
<td>.01</td>
</tr>
<tr>
<td>C1 - C2</td>
<td>.7468</td>
<td>.01</td>
</tr>
</tbody>
</table>

**r requirement for significance**

- .05 (.404)
- .01 (.515)

Judges' ratings were also treated with the Kendall Coefficient of Concordance to determine the degree of agreement among the judges' ratings. The degree of agreement among the three judges was significant at the .001 level of confidence. Refer to Table 3.

Spearman Rho Rank Order correlations were computed to determine relationships between judges' ratings and improvement in performance,

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3Ibid., pp. 202-213.
### TABLE 2
SUMMARY OF PEARSON PRODUCT MOMENT CORRELATIONS FOR BETWEEN JUDGE RATINGS

<table>
<thead>
<tr>
<th>Judge and Viewing</th>
<th>Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tape I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 - B1</td>
<td>.6043</td>
<td>.01</td>
</tr>
<tr>
<td>A1 - C1</td>
<td>.5916</td>
<td>.01</td>
</tr>
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<td>B1 - C1</td>
<td>.5191</td>
<td>.01</td>
</tr>
<tr>
<td>A2 - B2</td>
<td>.7469</td>
<td>.01</td>
</tr>
<tr>
<td>A2 - C2</td>
<td>.6241</td>
<td>.01</td>
</tr>
<tr>
<td>B2 - C2</td>
<td>.6667</td>
<td>.01</td>
</tr>
<tr>
<td>Tape II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 - B1</td>
<td>.3301</td>
<td>NS</td>
</tr>
<tr>
<td>A1 - C1</td>
<td>.6318</td>
<td>.01</td>
</tr>
<tr>
<td>B1 - C1</td>
<td>.5824</td>
<td>.01</td>
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<td>A2 - B2</td>
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<td>.05</td>
</tr>
<tr>
<td>B2 - C2</td>
<td>.5023</td>
<td>.05</td>
</tr>
</tbody>
</table>

- **r requirement for significance** .05 (.404)
  .01 (.515)

### TABLE 3
SUMMARY OF KENDALL COEFFICIENT OF CONCORDANCE OF JUDGES RATINGS

<table>
<thead>
<tr>
<th>Judge and Performance</th>
<th>W</th>
<th>(X^2)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, C 1</td>
<td>.7636</td>
<td>52.6884</td>
<td>.001</td>
</tr>
<tr>
<td>A, B, C 2</td>
<td>.8198</td>
<td>56.5662</td>
<td>.001</td>
</tr>
</tbody>
</table>

- **\(X^2\) required for significance** 49.73
improvement in performance and film viewings, and film viewings and judges' ratings. These findings will be discussed later in the chapter.

Prior to the discussion and interpretation of data revealed by the Introspective Analysis I and II and the Essential Elements Checklist, all other related data and findings will be presented. All data will be identified and discussed by the categories to which each subject was assigned based upon the identity of her mental image performer at the onset and conclusion of the study.

The general hypothesis of this study was that the more complete and detailed the mental image regarding essential elements of a particular skill, the more effective and efficient would be the performance of that skill.

This hypothesis dictated the following additional questions for study.

1. Is the performer in the mental image (picture) that of the subject or someone else?

2. From what angle or position is the skill being performed? (Is the performer viewed from the side, the back, the front, from above, or from the perspective of the imaged performer?)

3. Is the skill being performed on the tennis court in relationship to the net and/or opponent? If not, what is a part of the mental image other than the performer executing the skill?

4. Is the mental image the same as or different than the subject's own physical performance of the skill? To what degree is there a difference? (To be answered after viewing one's own performance.)
5. Will providing the model of an expert skill performance change the mental image of an individual learning the skill?

6. If a positive change occurs in the mental image toward a more accurate and complete image of the skill, will a positive change also occur in the skill performance toward a more effective, more efficient performance?

7. Will there be any significant relationship between the change in mental image, skill performance, and proficiency in the skill?

As previously indicated, subjects who participated in this study have been assigned to groups based upon the identity of the performer in their mental image at the beginning and conclusion of the investigation. Analysis and interpretation of the data will be presented according to the categories of images identified. Six categories or groupings of mental image emerged as a result of the data collected for this study and include the following: (1) Self and Self, (2) Self to Someone Else, (3) Self to Mary Slaughter, (4) Unknown to an Unknown Performer, (5) Unknown Performer to Self, and (6) Known Performer to Mary Slaughter.

General Discussion

Four of the six mental image categories included subjects with a range of previous instruction in tennis and varied degrees of motivational level. The Unknown to Self Mental Image Subject had no previous experience in tennis and indicated herself to be highly motivated throughout the study. The subjects in the Unknown to Unknown Performer Mental Image Category all had six to eight weeks previous experience in tennis. These subjects assessed their motivational level to be average throughout the study. The Known Performer to Mary Slaughter Image Group also
expressed an average level of motivation throughout the study. The previous participation experience of this group ranged from no previous experience to two weeks previous instruction.

In looking more closely at the other three image categories, several findings are observed. The participation experience and motivational levels varied within groups and some change occurred in the latter during the study. Some subjects' motivational level was reported as increasing and others indicated a decrease in motivational level. However, no subject reported herself as being less than average in motivation throughout the study.

The data do not indicate the cause for change in motivational level, but this change should be noted. There does not seem to be a pattern of change portrayed in the groups reflecting an increase or decrease in motivational level. It seems important to note that motivational change involved only subjects who had self as their mental image during some phase of the study. This finding might suggest some relationship between motivation and ego satisfaction. See Table 4 for the summary of participation experience, motivational level, and mental image identity for all subjects.

Motivational level in this study was determined by asking each subject to evaluate her motivation to participate in the study by using a five degree scale. The scale used included these degrees: no motivation, low motivation, average motivation, above average motivation, and highly motivated.
## TABLE 4

### SUMMARY OF PARTICIPATION EXPERIENCE, MOTIVATION LEVEL, AND MENTAL IMAGE IDENTITY

<table>
<thead>
<tr>
<th>Mental Image Identity</th>
<th>Subject</th>
<th>Participation Experience</th>
<th>Motivational Level Beginning</th>
<th>End</th>
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<tbody>
<tr>
<td>Self and Self</td>
<td>2</td>
<td>8 wks.</td>
<td>A. Av.</td>
<td>A. Av.</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>4 wks.</td>
<td>H. M.</td>
<td>A. Av.</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>0 wks.</td>
<td>Av.</td>
<td>A. Av.</td>
</tr>
<tr>
<td></td>
<td>16</td>
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<td>Av.</td>
<td>Av.</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>0 wks.</td>
<td>A. Av.</td>
<td>H. M.</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>0 wks.</td>
<td>A. Av.</td>
<td>H. M.</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>0 wks.</td>
<td>A. Av.</td>
<td>A. Av.</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>0 wks.</td>
<td>H. M.</td>
<td>A. Av.</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>0 wks.</td>
<td>A. Av.</td>
<td>A. Av.</td>
</tr>
<tr>
<td>Self to Someone Else</td>
<td>3</td>
<td>6 wks.</td>
<td>Av.</td>
<td>Av.</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>0 wks.</td>
<td>Av.</td>
<td>H. M.</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>0 wks.</td>
<td>A. Av.</td>
<td>A. Av.</td>
</tr>
<tr>
<td>Self to Mary Slaughter</td>
<td>7</td>
<td>4 wks.</td>
<td>H. M.</td>
<td>Av.</td>
</tr>
<tr>
<td></td>
<td>12</td>
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<td>Av.</td>
<td>Av.</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>0 wks.</td>
<td>H. M.</td>
<td>Av.</td>
</tr>
<tr>
<td>Unknown Identity to Self</td>
<td>23</td>
<td>0 wks.</td>
<td>H. M.</td>
<td>H. M.</td>
</tr>
<tr>
<td>Unknown to an Unknown Identity</td>
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<td>8 wks.</td>
<td>Av.</td>
<td>Av.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>6 wks.</td>
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<td>Av.</td>
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<tr>
<td></td>
<td>5</td>
<td>6 wks.</td>
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<td>Av.</td>
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<tr>
<td></td>
<td>6</td>
<td>6 wks.</td>
<td>Av.</td>
<td>Av.</td>
</tr>
<tr>
<td>Known Identity to Mary Slaughter</td>
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<td>Av.</td>
<td>Av.</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>2 wks.</td>
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</tr>
<tr>
<td></td>
<td>11</td>
<td>1 wk.</td>
<td>Av.</td>
<td>Av.</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>0 wks.</td>
<td>Av.</td>
<td>Av.</td>
</tr>
</tbody>
</table>

### Legend
- **Av.** Average
- **A. Av.** Above Average
- **H. M.** Highly Motivated
Introceptive Analysis by Subjects

Subjects were encouraged to provide accurate and complete information regarding their mental image of the forehand drive in tennis. All questions included in the Introceptive Analysis I and II and the Essential Elements Checklist were designed to provide as much information as possible so that the purpose of the study could be achieved. Several important points should be recognized regarding the subjects' discussion of their mental images.

A good deal of imagery may occur below the level of consciousness and that even if conscious, such imagery may not be noticed readily by persons unaccustomed to the awkward business of self-observation. At best mental images are hard to describe and easily disturbed.⁴ Recognizing this fact, it must be realized that all information reported by subjects may not reflect the components of the total mental image that may have existed. Therefore, interpretation of all data relevant to mental image will be based only upon the information revealed. Another point which seems appropriate to recognize is that "the thinker can focus on what is relevant and dismiss from visibility what is not."⁵ This statement implies that one has an ability to be selective in what is included in his mental image. Therefore, it would seem that an individual's priorities may possibly influence what is actually imaged or pictured in the mind's eye. Support of this point is provided by Arnheim. He states:

Under natural conditions, vision has to cope with more than one or two objects at a time. More often than not, the visual field is

⁵ Ibid., p. 105.
overcrowded and does not submit to an integrated organization of the whole. In a typical life situation, a person concentrates on some selected areas and items or on some overall features while the structure of the remainder is sketchy and loose.\(^6\)

Arnheim further states: "if a perceptual pattern is simply organized and differs clearly from its environment, it has a correspondingly good chance of being easily recognized."\(^7\)

In summary of this discussion, it seems apparent that there are certain inherent limitations in determining total components of one's mental image. It is the investigator's belief that gaining information about one's mental image is not impossible. Findings of this investigation support this belief and will be discussed in detail in this chapter. Implications of this research will be discussed in detail in Chapter V.

**Subjects' Performance Scores**

During the initial and final videotaping sessions of subjects' skill performance, successful and unsuccessful shots were recorded for each subject. The Performance Records indicate an improvement in the number of successful shots from the beginning of the study to its conclusion. Twenty-one of the twenty-four subjects' performance records indicate an increase in successful number of shots played during the taping sessions. Two of the remaining subjects did not increase the number of successful shots but remained the same throughout the study.

One subject who initially had ten successful shots finished her final performance with nine successful shots. However, it is the investigator's belief that this slight decrease does not indicate a

\(^6\)Arnheim, op. cit., p. 35.

\(^7\)Ibid., pp. 28–29.
decrease in skill performance. It is not likely that an individual would have a perfect performance record every time. Nine out of ten shots is still a very successful performance record. Refer to Table 5 for specific performance scores for each subject.

It would appear from the findings of this investigation that development of a more detailed, accurate mental image of the forehand drive does contribute to a more effective performance. The two subjects who did not improve their number of successful shots between videotaping sessions did not report any significant change in their mental images. Subjects who improved their performance record of successful shots reported extensive change in their mental images. These self reports appear to indicate the development of clear, accurate mental images of the skill performed.

The Spearman Rho Rank Correlation\(^8\) was used to determine if a relationship existed between the improvement in skill performance and the frequency of viewings of the demonstration films. The correlation was .1998 and was not significant. This finding might be explained by the fact that subjects who had the most skill ability used the films very few times. The unskilled, inexperienced subjects used the films a great number of times and believed they improved a great deal. However, it should be noted that skilled players would probably have difficulty showing an appreciable degree of improvement. It is also possible that experienced subjects' mental images were already well developed. This statement is supported by the findings of this study.

## TABLE 5

SUMMARY OF SUBJECTS SKILL PERFORMANCE RECORDS FOR BOTH TAPE RECORDING SESSIONS

<table>
<thead>
<tr>
<th>Subject</th>
<th>1st Videotape Performance Scores (0 - 10)</th>
<th>2nd Videotape Performance Scores (0 - 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>9</td>
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<tr>
<td>2</td>
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<tr>
<td>24</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Judges' Ratings

Judges' ratings of subjects' skill performance were determined by using a scale of 0 - 50 based upon the criteria identified in the Essential Elements Checklist. Raw scores for each viewing of the two tapes are found in Table 6. The ratings indicated in Table 6 of this chapter are composite scores for each tape. In light of this fact, the scale indicated in the Table reflects a scale of 0 - 100. The rating scale was doubled to keep the composite ratings in the same perspective as a rating for a single viewing.

As indicated previously, the judges' ratings of subjects' performances were treated with the Kendall Coefficient of Concordance\(^9\) to determine the degree of agreement among judges. The degree of agreement among judges on the first videotape performance was \(W=0.7363\) with the \(X^2\) being 52.6884. This computation was significant beyond the .001 level of confidence. The degree of agreement on the second videotape performance was also significant beyond the .001 level of confidence with \(W=0.8198\) and the \(X^2=56.5662\). Refer to Table 3 for more information on judges' ratings.

All intra-judge correlations as determined by the Pearson Product Moment Correlation\(^10\) were significant beyond the .01 level of confidence. Nine of the twelve possible inter-judge correlations were significant beyond the .01 level of confidence. Of the three remaining correlations, two were significant beyond the .01 level of confidence and one did not

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9 Siegel, op. cit., pp. 229-238.

<table>
<thead>
<tr>
<th>Mental Image Identity</th>
<th>Subject</th>
<th>1st Tape Performance Scores 0-10</th>
<th>2nd Tape Performance Scores 0-10</th>
<th>Judges Composite Ratings</th>
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<th>2nd Tape</th>
<th>Judge</th>
<th>Judge</th>
<th>Judge</th>
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<td>B</td>
<td>C</td>
<td>A</td>
<td>B</td>
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<td>50</td>
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<td>17</td>
<td>35</td>
<td>36</td>
<td>34</td>
<td>72</td>
</tr>
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</table>
prove to be significant at either level of confidence accepted for this study. See Tables 1 and 2 for correlations of specific judges.

Before discussing the judges' ratings in relationship to subjects' performance of the forehand drive, several points should be recognized. Although the actual rating assigned by each judge to each viewing of the same videotape performance might have varied slightly, for the most part, the assigned score kept the quality of the performance relatively the same. In looking at the judges' ratings for each subject one observes that thirteen of the twenty-four subjects appear to have improved their performance quality from the first to the last performance. However, the other eleven subjects' ratings seem to have remained about the same or appear to be inconsistent among judges. Therefore,
one might question whether all of the judges' ratings reflect improvement in performance.

Several factors should be identified which might explain this question. Since the mental image vantage point of many subjects changed, it is possible that the judges had greater difficulty rating the second performance than they did the first one. For example, if a subject's performance was first rated from behind, the judge had more information about the performance upon which to determine the rating than if the performance had been rated from any other vantage point. This fact would also be true if the reverse occurred in viewing from different vantage points. Some vantage points, as indicated by the judges, were more helpful in determining ratings than others. All three judges indicated it was much easier to rate a performance while viewing it from behind than from the side, for example.

The end result of a shot could be determined by the judges only when they viewed a performance from behind. This factor was reported to make a great deal of difference in the consistency of ratings not only for within judge ratings but between judges ratings. In light of this fact, a change in vantage points between the first and final performances could also effect any change perceived regarding improvement in performance. It should be noted that all judges verbally indicated they believed the majority of the subjects had improved their performance. However, improvement in performance might not be reflected in their final ratings due to the reasons cited.

A Spearman Rho Rank Order Correlation was computed between judges ratings and improvement scores to determine if there was a relationship.
This correlation was computed only for the ratings on the second performance. The relationship was not statistically significant. Refer to Table 7 for more information.

**TABLE 7**

**SUMMARY OF SPEARMAN RHO RANK ORDER CORRELATIONS FOR JUDGES RATINGS AND IMPROVEMENT SCORES**

<table>
<thead>
<tr>
<th>Judge</th>
<th>Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.0415</td>
<td>NS</td>
</tr>
<tr>
<td>B</td>
<td>.0732</td>
<td>NS</td>
</tr>
<tr>
<td>C</td>
<td>-.0137</td>
<td>NS</td>
</tr>
</tbody>
</table>

\[ r \text{ required for significance } 0.05 \quad (0.405) \]

\[ r \text{ required for significance } 0.01 \quad (0.515) \]

To conclude the discussion of the judges' ratings it is interesting to look at two particular mental image groups. The judges' ratings reflect an improvement in performance in the Unknown - Unknown Performer Mental Image Group. The greatest improvement in judges' ratings is shown by the three subjects who had six weeks previous instruction. The ratings of the fourth subject reflect very little change. It should be noted that this subject also reflected very few changes in aspects of her mental image. This finding may be an indication of why little improvement occurred in the judges' ratings. The number of successful shots increased for this subject, but there appears to be no change in the quality of the performance according to judges' ratings.

The three subjects who increased their number of successful shots also improved the quality of their performance according to the judges' ratings. These subjects also experienced more accurate and detailed
changes in aspects of their mental images. Positive changes in mental image do seem to influence positive change and improvement in skill performance.

The viewing vantage point for the subjects in this mental image group did not change from the initial performance to the last performance. It is conceivable that the judges were able to make a more consistent and accurate evaluation of the performance in light of this factor remaining constant. Seeing both performances from the same vantage point would allow these subjects to be rated on the same information throughout the study. This would appear to be an advantage to both the judges and the subjects.

The judges' ratings do not seem to reflect a great deal of improvement in quality of performance for the subjects in the Known Performer - Mary Slaughter Image Group. It can be noted, however, that one subject's ratings reflect consistent improvement among all three judges. It is interesting to note that this subject's personal performance scores and judges' ratings parallel each other. This subject also experienced the most positive changes in mental image components. Although all subjects in this group experienced an increase in successful shots, all subjects do not appear to have changed the quality of their performance to any great extent.

The above discussion is typical of the discussion which might be presented concerning the other mental image groups. It is apparent from the findings of this investigation that judges' ratings do not necessarily reflect improvement in performance even though the number of successful shots has increased. This finding might indicate that quality of
performance and success in execution of the skill are not necessarily related. On the other hand, the failure of the judges' ratings to indicate improvement might also be attributed to the change in viewing vantage points from the beginning of the study to its conclusion.

**Use of Demonstration Films**

Use of the six demonstration films designed to improve mental image of the forehand drive varied with each subject. Number of viewings by each subject ranged from six to twenty-nine times. Total number of viewings by all subjects for each film ranged from forty-six to sixty times. Subjects who had the least previous instruction in tennis viewed the films more frequently than the experienced subjects. The two subjects who had eight weeks previous experience viewed the films the fewest number of times - six and seven viewings respectively.

Subjects believed, as indicated by the Introspective Analysis II, the demonstration films contributed to their development of mental image and skill performance. Those subjects who made the most extensive use of the films indicated their mental images had improved a great deal as a result of films. Other subjects indicated a slight change in mental image improvement. Implications of the findings will be discussed in Chapter V. Refer to Table 8 for subject's individual records of film use.

The Spearman Rank Order Correlation was employed to determine the relationship between frequency of film viewings and judges' ratings. The correlations between use of films and each judge's ratings were all significant beyond the .05 and .001 level of confidence. However, the relationships were all negative. This might be explained by the fact that
<table>
<thead>
<tr>
<th>Subject</th>
<th>Side-90°</th>
<th>Side-45°</th>
<th>Front</th>
<th>Above-45°</th>
<th>Behind</th>
<th>Rallying</th>
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<tr>
<td>21</td>
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<td>3</td>
<td>1</td>
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<td>23</td>
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<td>5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>2</td>
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<td>58</td>
<td>60</td>
<td>46</td>
<td>57</td>
<td>53</td>
</tr>
</tbody>
</table>
the more skilled subjects viewed the films less than the unskilled, inexperienced subjects. Therefore, it might be expected to find a negative relationship between judges rating and frequency of film viewings. Refer to Table 9 for specific correlations.

TABLE 9
SPEARMAN RANK ORDER CORRELATIONS OF JUDGES' RATINGS AND FREQUENCY OF FILM VIEWINGS

<table>
<thead>
<tr>
<th>Judge</th>
<th>Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-.4487</td>
<td>.05</td>
</tr>
<tr>
<td>B</td>
<td>-.6026</td>
<td>.001</td>
</tr>
<tr>
<td>C</td>
<td>-.3766</td>
<td>.05</td>
</tr>
</tbody>
</table>

r required for significance .343 (.05) .485 (.01)

Analysis of Mental Image Assessments

Discussion of mental image assessments will be presented by the six mental image categories which have previously been identified. Data collected from the application of Introspective Analysis I and II and the Essential Elements Checklist will be reported and interpreted.

Each mental image category will be discussed in detail. The self-reported viewing effects of the six demonstration films upon mental image will be interpreted for each image category.

Mental Image Identity: Self and Self

A total of nine of twenty-four subjects identified the performer in their mental image as being self at the beginning and conclusion of the investigation. Five of the nine subjects initially indicated they visualized their mental image from behind. To clarify, "behind" indicates watching the performer (self) from the back as if looking over her
shoulder. Two other subjects visualized themselves from the front and the remaining two subjects pictured themselves from the side at a 90 degree angle and a 45 degree angle respectively. The same frequency of particular self internalized vantage points existed within this group at the conclusion of the investigation.

It is interesting to note the changes which occurred in each subject's personal vantage point. Two subjects reported no change in personal image vantage point. Two subjects who initially viewed their performance from behind concluded the study seeing their self-image from the front on a diagonal. Another subject who began her participation with a front view of her mental image ended her participation viewing her mental image from the back. The remaining subjects in this group's self-image vantage points underwent the following changes: side-90 degree angle to the back, front to side-45 degree angle, side-45 degree angle to the back, and back to side-90 degree angle. It is of interest to note the reversal of direction of some subjects' mental image vantage points. Refer to Table 10.

At the beginning of the study, each subject pictured herself performing the forehand drive on the tennis court with no specific location identified. At the conclusion of the investigation all subjects provided additional information regarding where they visualized the skill being executed. Such additional details included: near the baseline toward the right side of the court, behind the baseline, and near the baseline in relationship to the net and/or opponent. These reported changes appear to indicate a more developed mental image or an enriched image.
TABLE 10

SUMMARY OF MENTAL IMAGE VANTAGE POINTS

Mental Image: Self and Self

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Mental Image Vantage Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Behind</td>
</tr>
<tr>
<td>8</td>
<td>Side-90°</td>
</tr>
<tr>
<td>14</td>
<td>Front</td>
</tr>
<tr>
<td>16</td>
<td>Behind</td>
</tr>
<tr>
<td>18</td>
<td>Behind</td>
</tr>
<tr>
<td>19</td>
<td>Behind</td>
</tr>
<tr>
<td>20</td>
<td>Behind</td>
</tr>
<tr>
<td>22</td>
<td>Side-45°</td>
</tr>
<tr>
<td>24</td>
<td>Front</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td></td>
<td>Behind</td>
</tr>
<tr>
<td></td>
<td>Side-45°</td>
</tr>
<tr>
<td></td>
<td>Front Diagonal</td>
</tr>
<tr>
<td></td>
<td>Front Diagonal</td>
</tr>
</tbody>
</table>

Only two of the nine subjects did not initially provide information about the flight of the ball as pictured in their image. This information may not have been available to these subjects due to the vantage point from which the mental image was viewed. One of these subjects never had ball flight as part of her mental image throughout the investigation. The seven remaining subjects described the ball flight in their mental picture. The investigator, however, has some reservation about the reliability of the information based on the vantage point from which the image was perceived. Visualizing the image from the side at a 90 degree angle from the line of ball flight would not appear to provide information about the ball flight. Other vantage points would provide limited information relative to ball flight. Therefore, it is not known if the ball flight described by some subjects was actually seen...
or if the information was provided upon the basis of their own skill performance or on a preconceived standard. Changes in visualized ball flight occurred in a positive direction. These subjects providing information regarding the flight of the ball finished their involvement in the study visualizing a low, fast ball skimming across the net. Some of the subjects initially indicated a high arc and little speed in describing the ball flight visualized. Again, these changes appear to indicate that a more accurate mental image was being developed.

Information obtained by the Essential Elements Checklist indicated all subjects who viewed self in their mental image did visualize, to some degree, the essential elements necessary to the execution of an efficient forehand drive. As a result of participation in this study the following changes in essential elements of the forehand can be identified. Most subjects initially visualized the image (self) as remaining in contact with the ball a short period of time, but pictured an increase in time the ball remained in contact with the racquet at the conclusion of the study. Tuning in to the ball became more clear after participation in the study. Subjects visualized their self-image as watching the ball all the time, actually seeing the ball until it left the racquet on their own stroke. Prior to involvement in the study only one of these subjects saw the ball before it bounced on her side of the court.

The quality of the stroke visualized in the self-image improved during participation in the study. Initially, subjects described the quality of their self-image stroke as being hurried, tense, jerky, and somewhat uncoordinated. At the conclusion of the study, the quality of the imaged stroke embodied the characteristics of smoothness, coordination,
relaxation, power, and control. These changes appear to be positive in nature and indicate a more accurate and correct mental image.

Self-image subjects also indicated positive changes in regard to racquet – body – ball alignment. In the beginning only one subject pictured the ball being played slightly in front of the body. At the conclusion of the investigation subjects indicated the ball was being played at the center of the body or slightly in front of the body. Again this finding reflects a more accurate mental image in respect to this particular component or essential element.

Self-image subjects indicated the backswing in the final Introspective Analysis to be started much earlier than was pictured in their first mental image. Most subjects reported the backswing started as soon as the ball came off the opponent's racquet or as soon as the self-image began to position herself to play the ball. Initially all but one subject pictured the backswing as beginning just before or just as the ball bounced on the image's side of the court.

The grip pictured in the self-image group did not change for these nine subjects throughout the study. The grip visualized was the Eastern grip.

It would appear that the data obtained from the Self and Self Mental Image Group would support the conclusion that positive changes did occur in the development and/or improvement of one's mental image. It seems logical the quality of skill would improve with a positive change in the racquet – body – ball alignment and starting the backswing early. Positive changes in regard to these two elements would logically seem to eliminate tenseness, hurriedness, jerkiness, and lack of coordination.
The self-image at the conclusion of the study seemed to respond with greater awareness and better anticipation than did the initial self image.

Subjects in the Self and Self Image Group used the six demonstration films a total of 146 times or an average of 16 times per subject. Five of the nine subjects indicated that use of the demonstration films was the single factor which contributed most to the development of their mental image of the forehand drive. Other subjects in this group reported verbal instructions and coaching hints, demonstrations in class, and physical practice to be the factors contributing most to the development of their mental image. Refer to Table 11 for specific details.

The differences which are observed in regard to this information would appear to be indicative of the fact that factors influencing learning vary with individuals. It should be noted, however, that all of the subjects did accept the model performer in the demonstration films. This factor does not appear to be the cause for the difference of influence or impact of the films upon the subjects' mental images. Differences do seem to indicate that visual cues are more helpful for some subjects and verbal cues are more meaningful for other subjects. Educators and physical educators have recognized this fact for many years. This study seems to support this supposition. All subjects reported the use of the films helped to improve their mental image and skill performance of the forehand drive. The degree of improvement in both image and skill performance varied from slight improvement to great improvement.

At the onset of the study two subjects who pictured themselves as the performer in their mental image assessed their mental image and skill
### TABLE 11

**SUBJECTS ACTUAL USE OF DEMONSTRATION FILMS**

Mental Image: Self and Self

<table>
<thead>
<tr>
<th>Subject</th>
<th>Side 90°L</th>
<th>Side 45°L</th>
<th>Diagonal</th>
<th>Front 45°L</th>
<th>Above 45°L</th>
<th>Behind</th>
<th>Rallying</th>
<th>Total Use of all 6 Films</th>
<th>Single Factor Contributing Most to the Development and/or Improvement of One's Mental Image</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>*1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>6 Films</td>
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</tr>
<tr>
<td>8</td>
<td>3</td>
<td>3</td>
<td>*5</td>
<td>4</td>
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<td>4</td>
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<td>22 Films</td>
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<td>2</td>
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<td></td>
<td>11 Physical Practice</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>*6</td>
<td>4</td>
<td></td>
<td>29 Films</td>
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<td>*3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td>17 Films</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>3</td>
<td>6</td>
<td>*5</td>
<td>2</td>
<td>6</td>
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</tr>
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<td>10 Demonstrations in Class</td>
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<td>2</td>
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<td>2</td>
<td>2</td>
<td></td>
<td>12 Verbal Instructions and Coaching Hints</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>*2</td>
<td>*3</td>
<td>*2</td>
<td>*2</td>
<td>*4</td>
<td>*2</td>
<td></td>
<td>15 Verbal Instructions and Coaching Hints</td>
<td></td>
</tr>
</tbody>
</table>

*Indicates most helpful film

Note: #24 indicated all films to be helpful.

#22 could not identify a most helpful film.
performance as being the same in quality and detail. The other seven subjects reported their mental image as being better than their own skill performance. At the conclusion of the study all subjects evaluated their mental image as being better than their skill performance. All of these subjects believed their comparisons to be accurate.

Mental Image Identity: Self and Someone Else

A total of three subjects in twenty-four identified the performer in their mental image as being self at the beginning of the study and someone else at its conclusion. Two subjects in this group pictured their mental image performance from the side-45 degree angle at the beginning of the study. The third subject described her first mental image vantage point as being from the eyes of her image. In other words, she viewed her self image from within herself. This subject was the only one of the twenty-four subjects in the study who had such an internalized perspective of her mental image. This self analysis is difficult to interpret as this subject had no previous experience in tennis. At the conclusion of her participation in the study, this subject pictured her mental image from the front and the performer was a female unknown to the subject. The other two subjects in this image group continued to visualize their image from the side at a 45 degree angle; however, the performer had changed from self to another female performer.

One subject could identify by name the performer in her image and the other one could not. The subject who could identify her mental image performer had six weeks previous experience in tennis which might explain her ability to make a positive identification of the imaged
performer. This subject had also played quite frequently with the girl she identified as being in her image. She considered the girl to be highly skilled. The quality of performance of the other subject's image was also highly skilled. The subject who could not identify her imaged performer thought the performer might be one she had seen on a tennis clip advertisement on television. In both cases cited, respect for the performance demonstrated by the new image seemed to influence a desire to emulate that performance. Refer to Table 12 for details for each subject.

**TABLE 12**

**SUMMARY OF MENTAL IMAGE VANTAGE POINTS**

<table>
<thead>
<tr>
<th>Mental Image: Self to Someone Else</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>17</td>
</tr>
</tbody>
</table>

All subjects in the Self-Someone Else Image Group pictured the initial imaged performance as taking place on the tennis court with specific reference to the baseline in relationship to the net. At the end of the study one subject also included the opponent in her description of what was a part of the environment in the mental image. Basically there was very little change in this particular component of the subjects' mental image. It appears from the data collected concerning this essential component of mental image that the subjects were satisfied with the
details they initially possessed. Another possible explanation might be that other aspects of the mental image were higher in priority than the one cited.

Two subjects in this particular image group were able to describe ball flight throughout the study. The described ball flight was low and fast across the net. One subject, at the conclusion of this investigation, reported that the speed of the ball had slowed down slightly. The third subject was never able to describe ball flight. However, by the end of the study this subject did see the ball when it was hit but then lost it. This finding might be explained by the fact this subject visualized her mental image from the side at a 45 degree angle. After the ball was hit, it was out of her field of vision. This self report interpretation does not explain why or how subjects in this group who could see ball contact and describe its flight across the net were able to do so. It does seem important, however, that the ball flight which was visualized or imagined embraced the qualities of being low and fast. These qualities of ball flight for the forehand drive would enhance more effective shots on the court.

Information obtained by the Essential Elements Checklist indicated some marked differences in the subjects in the Self-Someone Else Mental Image Group. In light of this observation, essential elements of the subjects mental image will be discussed in relation to their participation experience.

The subject who had six weeks previous experience in tennis visualized very correct essential elements of the forehand drive throughout the study. The subject actually saw ball contact and visualized her
mental image as being constantly tuned in to the ball. The time the ball
remained in contact with the racquet was short in duration throughout the
study. The quality of the imaged performance was very good with the im-
aged performer becoming very relaxed at the end of the investigation.
Otherwise the stroke was smooth, powerful, coordinated, and strong. The
imaged performer in this subject's mental image always played the ball
slightly in front of her body and started her backswing as soon as the
ball was crossing the net. The Eastern grip remained constant throughout
the study.

The two inexperienced subjects in the Self-Someone Else Image
Group experienced more change than the experienced subject in the mental
image pictured at the conclusion of the investigation. At first both
subjects saw racquet-ball contact as being very short in duration. One
subject's mental image improved in this respect with the final imaged
performer remaining in contact with the ball a long time. Both subjects
expressed difficulty in determining how long the ball was visualized or
tracked by their images. In fact, neither subject was able to incorporate
this essential element into their mental image.

Both inexperienced subjects reported their first mental image
performer as being tense. The stroke was uncoordinated, unbalanced,
jerky, and was awkward. In their final mental image both subjects re-
ported the quality of the stroke was smooth, relaxed, and coordinated.
The stroke was said to look very professional and had all the essential
elements. Racquet - body - ball alignment improved in one subject's
image and became less accurate in the other subject's image. However,
the subject who indicated that her final image contacted the ball when
it was slightly behind the body, also reported that her imaged performer
did not start her backswing soon enough. It was not started until the
ball was about to bounce on her side of the court. The subject who im-
proved racquet - body - ball alignment in her image pictured the back-
swing as beginning as soon as the ball left the opponent's racquet. The
degree of development of these two elements do appear to influence one
another and are inter-related. The degree of efficiency of the backswing
seems to assist the development of a more correct racquet - body - ball
alignment. Both subjects pictured the Eastern grip in their mental im-
age throughout the study.

It appears from the data collected the Self-Someone Else Mental
Image Group did not experience as much change in their mental images as
the Self and Self Image Group. In fact, the reported change was slight
for all three subjects. Possibly having a different performer in this
group's mental image was an adjustment in itself. It is also possible
the new imaged performance was not familiar enough at the conclusion of
the study to be accurately described in detail. It would seem that the
experienced subject in this particular group did have a more clearly
developed accurate mental image than did the inexperienced subjects. It
would seem to this investigator that being able to identify the performer
in the image by name is important to the subject and this knowledge pro-
vides a sharper, clearer picture of the performance which is mentally
visualized.

Subjects in the Self-Someone Else Mental Image Group viewed the
six demonstration films a total of thirty-one times or an average of ten
viewings per subject. Individual subject film use is located in Table 13.
<table>
<thead>
<tr>
<th>Subject</th>
<th>Side 90°L</th>
<th>Side 45°L</th>
<th>Front</th>
<th>Above 45°L</th>
<th>Behind</th>
<th>Rallying</th>
<th>Total Use of all 6 Films</th>
<th>Single Factor Contributing Most to the Development and/or Improvement of Mental Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>*2</td>
<td>2</td>
<td>12</td>
<td>Physical Practice</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
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<td>1</td>
<td>1</td>
<td>*1</td>
<td>1</td>
<td>7</td>
<td>Films</td>
</tr>
<tr>
<td>17</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>*2</td>
<td>12</td>
<td>Demonstrations in Class</td>
</tr>
</tbody>
</table>

*Indicates most helpful films
Only one subject in this particular group indicated the films as being the single factor which contributed most to the development of her mental image. The other two subjects indicated physical performance and demonstrations in class contributed most to the development of their mental image. However, all three subjects indicated a positive acceptance of the performer in the demonstration films.

The experienced subject in the Self-Someone Else Image Group indicated the films contributed greatly to the improvement of her skill performance of the forehand drive. However, the inexperienced subjects in this group revealed the films had contributed only slightly to the improvement of their skill performance. These findings do seem to correspond with the slight change in performance as indicated by the judges' ratings of these subjects. Assessments regarding personal skill appear to support each other. Subjects reported their skill assessments in regard to improvement in skill were accurate. The experienced subject also felt her assessment of improvement to be very accurate. All subjects in the Self-Someone Else Image Group compared their mental image and skill performance and indicated the mental image was better than skill performance. Initially the experienced subject evaluated her mental image to be only slightly better than her mental image. It was assessed to be much better than her skill performance at the conclusion of the study. The experienced subjects in this image group indicated their mental image to be much better and very much better than skill performance throughout the study.

The data for the Self-Someone Else Mental Image Group indicated very little change in accurateness and completeness of the subjects mental
images. It is the investigator's belief that an inaccurate mental image will not allow an individual to develop an efficient and effective forehand drive. The experienced subject's mental image was accurately developed, not totally as a result of this study, and successful shots did improve during the study. Success and accurate images do seem to be related to the findings of this research.

Mental Image Identity: Self and Mary Slaughter

A total of three of twenty-four subjects identified the performer in their mental image as being self at the beginning of the study. At the conclusion of the investigation the performer in their image was Mary Slaughter, the model in the demonstration films.

Throughout the study each subject in this image group visualized her mental image of the forehand drive from different vantage points. Mental images of the Self-Mary Slaughter Group reflected these vantage points: behind and side-90 degree angle, front and side-45 degree angle, and side-45 degree angle front diagonal. Again it is interesting to note the reversal of vantage points between the last two subjects. Refer to Table 14 for particular vantage points of subjects in this image group.

Each subject in the Self-Mary Slaughter Image Group visualized her image performing the forehand drive in a specific location on the tennis court. The environment was described in detail in both the first and final Introspective Analysis. Details included baseline, center back court, and right back court near the baseline with the Mary Slaughter image being more specific in detail than the self image. The richness of this aspect of the image corresponds with the Self and Self Image Group.
All subjects in this group initially provided information about the ball flight as pictured in their mental image. One subject indicated that her image did not actually see the ball being hit. It is interesting that all these subjects initially described ball flight as being high with medium and fast speed. At the conclusion of the study, all three subjects could see the ball actually being hit and described the ball flight as low and fast across the net. From the mental image vantage points identified by these three subjects, one must again question if the ball flight was actually seen or if the description provided was based upon personal experience or a preconceived standard. Changes in ball flight as revealed were positive in nature. A low and fast forehand drive is more effective and more efficient than a high medium or slow speed forehand drive. This reported change would seem to indicate that a more accurate mental image was being developed.

Information obtained by the Essential Elements Checklist indicated all subjects in the Self-Mary Slaughter Image Group mentally pictured the essential elements necessary to the execution of an efficient forehand drive. However, more consistency existed among the three
subjects in this image group than did in the Self and Self Image Group. Two subjects initially visualized self as being in contact with the ball a short period of time while the third subject saw self as being in contact with the ball a medium length of time. This subject's image of racquet-ball contact did not change during the study. The other two subject's image (Mary Slaughter) increased racquet-ball contact to medium time and as long a time as possible.

Tuning in to the ball reflected the same pattern of development as did racquet-ball contact. One subject's mental image remained the same throughout the study with the ball actually being watched until it was contacted by the racquet. The other two subjects' image initially did not see the ball all the way through the racquet contact. However, at the conclusion of the study, these subjects' images also saw the racquet-ball contact. The reported information regarding this element indicates the tuning in process lasted a longer time at the conclusion of the study.

The quality of the stroke visualized by two of the subjects in the Self-Mary Slaughter Image Group was fairly accurate throughout the study. It was described as being smooth, coordinated, and relaxed. The third subject experienced considerable change in quality when the performer in the mental image changed from self to Mary Slaughter. Tenseness, jerkiness, and lack of coordination were supplanted with relaxation, smoothness, and coordination. In addition, the following details were added to the quality of the stroke: very good follow through, good grip—firm but not tense, and good movement on the court. Additional details which were added to the quality of the stroke of the other two subjects
were good backswing and follow through, and good placement of the shot. These changes or additions in quality appear to be positive in nature and indicate a more effective and efficient mentally imaged performance.

With the changes in mental image performer from self to Mary Slaughter, the racquet-body-ball alignment improved. Two subjects had pictured their self images as contacting the ball when the ball was slightly behind the body. The third subject pictured the ball being even with the center of the body. At the conclusion of the study all three subjects mental image (Mary Slaughter) contacted the ball slightly ahead of the body. This particular change indicates a more efficient execution of the shot than was originally pictured.

The backswing as pictured by the Self-Mary Slaughter Group throughout the study would seem to start too late to be efficient. Two of the subjects did not visualize the backswing starting until the ball was crossing the net or just before it bounced on the imaged performer's side of the court. One subject pictured an earlier backswing in her mental image when the performer changed to Mary Slaughter. This subject also saw her image beginning the backswing as soon as the machine released the ball. It is of interest to note the ball boy machine became part of this subject's mental image. A possible explanation of this addition to the mental image might be the fact that five of the six demonstration films incorporated the use of a ball boy machine and the videotaping sessions also employed a ball boy machine. Another possible explanation of this finding might be that the subject who reported the existence of the ball boy machine actually saw this equipment as part of her image. The demonstration film she used most frequently was the
performance filmed from behind. In this film the ball boy machine was constantly a part of her field of vision.

The Eastern grip was a part of all three subjects' mental image throughout the study. This element of the forehand drive did not change as a result of participation in the study.

It would appear from the data collected from the Self-Mary Slaughter Image Group that positive changes did occur in the improvement and/or development of all three subjects' mental images of the forehand drive. The change in image from self to Mary Slaughter seemed to make the subjects much more aware of specifically correct details encompassed in their mental image of the skill. These subjects seemed to conclude their participation in the investigation with a very clear, accurate, and correct mental image.

The subjects in the Self-Mary Slaughter Image Group used the six demonstration films a total of twenty-nine times or an average of ten times per subject. Two of these subjects indicated viewing the demonstration films was the single factor which contributed most to the development of their mental image. The other subject revealed physical practice as being the single most influencing factor in the development of her mental image. Individual subject viewing frequencies are located in Table 15.

The fact that all three subjects' mental images changed from self to Mary Slaughter strongly supports the acceptance of the model in the films. Two subjects reported film viewing improved their mental image a great deal. The third subject indicated the films improved her mental image and skill only slightly. This same subject attributed her
TABLE 15

SUBJECTS ACTUAL USE OF DEMONSTRATION FILMS

Mental Image: Self to Mary Slaughter

<table>
<thead>
<tr>
<th>Subject</th>
<th>Side 90°L</th>
<th>Side 45°L</th>
<th>Side 45°L</th>
<th>Front Diagonal</th>
<th>Above 45°L</th>
<th>Behind</th>
<th>Rallying</th>
<th>Total Use of all 6 Films</th>
<th>Single Factor Contributing Most to the Development and/or Improvement of Mental Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>Physical Practice</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>2</td>
<td>*2</td>
<td>2</td>
<td>2</td>
<td></td>
<td>*3</td>
<td>13</td>
<td>Films</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>*3</td>
<td></td>
<td>1</td>
<td>8</td>
<td>Films</td>
</tr>
</tbody>
</table>

*Indicates most helpful film
improvement in mental image to physical practice which might possibly explain the degree of improvement in image. It would seem that physical performance of a skill would improve more slowly than mental performance of the skill. However, a relationship does seem to exist between the mental image and the skill performance of a skill and the quality present in both.

Although all three subjects revealed the demonstration films were helpful in improving their mental images, the degree of improvement varied from slight to great improvement. The films were reported as having improved skill performance of the subjects slightly. However, the performance scores of the Self-Mary Slaughter Image Group would seem to indicate more than a slight improvement. A possible explanation of this finding might be that success was not the major factor of concern for these subjects. It is entirely possible that improvement with these subjects included a high standard of quality which was encompassed in their final mental image, but was not yet a part of actual skill performance. For the most part these subjects' mental images were indicated as being very much better than their own skill. One subject revealed her self image as being the same in quality as her mental image. This finding parallels the findings of the Self and Self Mental Image Group. That image group included subjects who made the same comparison in relation to skill performance and mental image. Subjects in the Self-Mary Slaughter Image Group believed their comparisons of mental image and skill performance to be very accurate.
Mental Image Identity: An Unknown Female to Self

Only one subject in this study identified the performer in her first mental image as being an unknown female. She concluded the investigation with her mental image as self. This subject's first mental image vantage point was from the side at a 90 degree angle. Her final mental image was visualized from a 45 degree angle and slightly back from that angle. This change in mental image vantage point is unlike any change in vantage points previously discussed. It should be noted that this particular subject could view the performer in her mental image from many different vantage points. However, the two vantage points cited were revealed as being the most common. In addition, the female performer who was first visualized did not have a face. This point seems worth noting. Possibly the performer did not have a face because the skill demonstrated in the subject's image was a composite of several performers.

The Unknown Female-Self Mental Image Subject visualized the performance in her image as taking place on the tennis court throughout the study. This subject did not indicate where on the court the performance occurred.

The flight of the ball was described as being low and fast. The imaged performer was reported as actually seeing the ball being hit on each stroke. This aspect of mental image did not change throughout the study, but it was well developed initially and probably met the requirements for this subject.

Information obtained by the Essential Elements Checklist with regard to the Unknown Performer-Self Image Subject indicated the necessary elements of the forehand drive were present to some degree. Racquet -
ball contact decreased in time during the investigation. There was no change in tuning in to the ball. The subject pictured her mental image as watching the ball all the time and reported her imaged performer saw the ball contact the racquet on every shot.

The quality of the stroke visualized by this subject was described as being a "perfect shot". Everything about this subject's mental image was reported as being perfect! The imaged performer was described as not being able to make a poor shot or do anything wrong.

Racquet - body - ball alignment did not change throughout the study. The imaged performer was visualized as playing the ball when it was even with the center of her body. The timing of the backswing changed. At first the backswing began just before the ball crossed the net. At the end of the study the backswing began as soon as the imaged performer began to move into position to play the ball. The Eastern grip was pictured in both mental images.

Although very few changes occurred in the mental image of the Unknown Female Performer-Self Mental Image Subject, it seems important to note the extremely positive attitude with which the subject viewed her mental image. She was extremely pleased with her image as indicated by her Introspective Analysis I and II and was very excited her image stroked the ball so well. This subject indicated she wished she could play as well as her image. Possibly this attitude toward her image throughout the study influenced her to adopt self as her own image. This possibility is certainly worth considering.

Use of the demonstration films by this subject seems to reflect the motivational level of this subject as being highly motivated. This
assessment was indicated by the subject as well. She viewed the films a total of twenty-five times and indicated the films were the major factor contributing most to the development of her mental image. The Introspective Analysis by this subject indicated her mental image to be about the same at the end of the study as it was in the beginning. It would seem to the investigator that it would be difficult to improve such a positively viewed mental image! Details of film use can be found in Table 16.

Use of the films by the subject in the Unknown Performer-Self Mental Image Category suggests the subject did accept the model performer in the films. She openly volunteered how much she liked the performer in the films and how much she learned by watching her perform. This subject believed her skill performance improved greatly during her participation in the study and attributed this improvement to viewing the demonstration films. She reported her mental image to be very much better than her own skill performance throughout the study. This subject believed this comparison to be very accurate. Her Introspective Analysis revealed that developing a mental image had really helped her performance and she believed her game would continue to improve.

Mental Image Identity: Someone Unknown

Someone Unknown

A total of four of twenty-four subjects identified the performer in their mental image as being an unknown identity at the beginning and conclusion of the study. All of the subjects' mental image performers increased in skill ability and were considered to be highly skilled in the final Introspective Analysis. Of these four subjects, one consistently
TABLE 16

SUBJECTS ACTUAL USE OF DEMONSTRATION FILMS

Mental Image: An Unknown Performer to Self

<table>
<thead>
<tr>
<th>Subject</th>
<th>Side 90°L</th>
<th>Side 45°L</th>
<th>Front Diagonal</th>
<th>Above 45°L</th>
<th>Behind</th>
<th>Rallying</th>
<th>Total Use of all 6 Films</th>
<th>Single Factor Contributing Most to the Development and/or Improvement of Mental Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>*5</td>
<td>5</td>
<td>25 Films</td>
<td></td>
</tr>
</tbody>
</table>
identified her imaged performer as being a man. The other three subjects in this group consistently identified their image as a female.

Throughout the investigation all subjects in this image group visualized their mental image performance from the same vantage point. Individual vantage points did not change. The subject with the most previous experience pictured her mental image from behind while the other three subjects pictured their imaged performance from the side at a 45 degree angle. One member of the side vantage point group visualized her imaged performer from above the court. At the conclusion of the study the imaged performance was court level. This same subject also viewed her image from the left side of the court rather than the right side. More of the imaged performer's back was seen during the imaged performance. Refer to Table 17 for individual subject information.

**TABLE 17**

**SUMMARY OF MENTAL IMAGE VANTAGE POINTS**

MENTAL IMAGE: UNKNOWN PERFORMER AND UNKNOWN PERFORMER

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mental Image Vantage Point</th>
<th>Beginning</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Behind</td>
<td>Behind</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Side-45°</td>
<td>Side-45°</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Side-45°</td>
<td>Side-45°</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Above Side-45°</td>
<td>Side-45°</td>
<td></td>
</tr>
</tbody>
</table>

Each of the four subjects in the Unknown Performer–Unknown Performer Mental Image Group pictured the imaged performance as taking place on the tennis court throughout the study. The three subjects who had six weeks previous experience enriched the details of performance location.
The eight weeks subject consistently only visualized the general environment - the court. Based on this subject's past experience details of location on the court may not have been an essential priority for her and therefore the background was blocked out. According to Arnheim, "if the close-up view is sharp, the background is blurred, and vice-versa."11

Two subjects in this particular image group consistently visualized their image actually hitting the ball and indicated the ball flight as being low and fast across the net. The other two subjects described the same ball flight at the end of the study. These subjects did not see ball flight initially. The fourth subject initially saw the ball flight and described it as being medium speed and medium height as it crossed over the net. At the conclusion of her participation ball flight was no longer a part of this subject's mental image. For three of the four subjects the ball flight described had desirable characteristics for an effective and efficient forehand drive. The subject who lost ball flight in her image was the one who had eight weeks previous experience.

Information obtained by the Essential Elements Checklist indicated that all subjects in the Unknown-Unknown Performer Mental Image Group did not mentally visualize all of the essential elements necessary to the execution of an efficient forehand drive. Two of the subjects saw the racquet-ball contact as being short in time throughout the study. The other two subjects did not see the ball being hit at all initially. At the conclusion of the study one of these subjects saw the racquet-ball contact as being short in time and the other more experienced subject pictured it to be as long as possible.

Three subjects in their first mental image could not indicate how long the performer in their image watched the ball. Two of these subjects still did not have any information to reveal about the tuning in process in their second mental image. The other subject reported her mental image as constantly watching the ball at the end of the study. The tuning in process was well engraved in the fourth subject's mental image (8 weeks experience). The imaged performer watched the ball until after it was contacted by the racquet and the ball was the main object of visualization in playing the forehand drive.

The quality of the forehand drive in all four subjects' mental image was well developed throughout the study. It was pictured by all subjects as being smooth, relaxed, coordinated, controlled, and powerfully hit. More details were included in each subject's final description of the quality of the stroke. Details included good follow through, stroke begins as she (image) moves to hit the ball, tunes in well, plays each shot with confidence, and the form is excellent. Although the quality of the pictured forehand drive was already well established, these four subjects seem to have incorporated many more definite characteristics into their mental image profile. Possibly quality of the stroke becomes of primary importance when previous experience in tennis has been fairly extensive. This would appear to be the situation with these four subjects. Certainly these added characteristics relevant to the quality of the stroke were positive in nature and should contribute to the success and effectiveness of personal skill.

A marked change took place in the development and/or improvement of racquet - body - ball alignment for all four subjects in this image.
group. At first three subjects reported their images saw the ball as being stroked when it was slightly behind the body. The fourth subject did not have any racquet - body - ball alignment information about her image at the onset of the study. At its conclusion all subjects in the Unknown-Unknown Performer Image Group visualized their imaged performer as hitting the ball when it was slightly in front of the body. This change represents a more efficient stroking of the ball than was originally imaged.

Three subjects in this particular image group pictured the backswing as beginning when the ball came off of the opponent's racquet or as the imaged performer began to move into position to play the ball. The fourth subject initially did not know when her imaged performer started her backswing as she saw her image as always having the racquet back in position to stroke the ball. At the conclusion of the study she indicated her imaged performer started the backswing before the ball came to her. This does not seem to imply much change in the belief of the investigator. Three subjects identified the grip used by their imaged performer as being the Eastern grip. The fourth subject could not identify the grip used by her mental image performer.

From the data collected concerning the Unknown-Unknown Performer Mental Image Group it seems that the most perceivable significant changes in mental image took place relevant to the quality of the stroke imaged, the backswing, and racquet - body - ball alignment. Other details of these subjects' mental image seemed to have been previously well established.
Two of the subjects in this group indicated the demonstration films were the single most important factor contributing to the development of their mental image. The other two subjects indicated verbal instructions and coaching hints and physical practice were the factors contributing most to the development of their mental image. All subjects reported their skill had improved a great deal as a result of seeing an expert performer.

The four subjects in the Unknown-Unknown Mental Image Performer Group used the demonstration films a total of 57 times or an average of 15 times per subject. It is interesting to note that the two subjects who made the most use of the films also showed the greatest improvement in performance according to the judges' ratings. The subject showing the greatest improvement in performance also made the most extensive use of the demonstration films. It would appear that use of the films did influence improvement in skill with this image group. The two subjects who viewed the films most frequently indicated the films were the single factor contributing most to the development and/or improvement of their mental image and greatly helped their skill performance. See Table 18.

It seems possible to suspect that two of the subjects in this group may have been verbally and kinesthetically oriented rather than visually oriented according to film use. It is of interest to note that the subjects who viewed the films more frequently found the films which showed the performer from the side at a 45 degree angle to be the most helpful. This would seem logical since their own mental image vantage point was from the same perspective. It would seem to the investigator that this film would be the most helpful and most easily identified with.
### TABLE 18

SUBJECTS ACTUAL USE OF DEMONSTRATION FILMS

Mental Image: Unknown Performer and Unknown Performer

<table>
<thead>
<tr>
<th>Subject</th>
<th>Side 90°L</th>
<th>Side 45°L</th>
<th>Front Diagonal</th>
<th>Above 45°L</th>
<th>Behind</th>
<th>Rallying</th>
<th>Total Use of all 6 Films</th>
<th>Single Factor Contributing Most to the Development and/or Improvement of Mental Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>*2</td>
<td>7</td>
<td>Verbal Instructions and Coaching Hints</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>*2</td>
<td>2</td>
<td>8</td>
<td>Physical Practice</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>*5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>15</td>
<td>Films</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>*4</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>27</td>
<td>Films</td>
</tr>
</tbody>
</table>

*Indicates most helpful film
This identity would also appear to facilitate a comparison of self performance and that of the model performer.

All four subjects in the Unknown-Unknown Performer Mental Image Group accepted the model in the demonstration films. However, based upon the usage of the films it would appear that two of the subjects seemed to gain more from the model performer than the others.

Initially all four subjects in this image group reported their mental image performance was better than their own skill performance. However, after participation in this project two subjects evaluated their mental image performance and their own performance to be the same. The other two subjects indicated the imaged performance to still be better. All subjects believed their comparisons of mental image and skill performance to be accurate.

It would appear from the findings related to the Unknown and Unknown Mental Image Group that improvement in mental image does influence improvement in skill performance. It also appears that extensive use of the films can enhance skill improvement in the forehand drive.

Mental Image Identity: Someone
Known to Mary Slaughter

Four subjects of twenty-four identified the performer in their mental image as being a known performer in the beginning of the study. At the conclusion of the investigation the performer in the mental image was identified as Mary Slaughter, the model in the demonstration films.

Two subjects' first mental image had a side view (45 degree angle) vantage point. Their final mental image vantage point was from the front. The other subjects in this group had different vantage points and these
changed by the conclusion of the study. One subject pictured her image from the front and from the side at a 45 degree angle respectively. The other subject began with a vantage point from behind the performer and concluded her participation with a front vantage point. It is interesting to note the reversal of vantage points in the first three subjects discussed. This reversal pattern is the same as those previously mentioned.

It seems worthwhile to note the identity of the initial performers in the Known Performer-Mary Slaughter Image Group. One performer was a subject's roommate, another performer was a boyfriend and captain of the tennis team, a third performer was the investigator, and the other performer was Arthur Ashe. Discussion of the last two identities seems worthwhile. The performers identified were the first performers in tennis ever seen by the subjects who mentally pictured them. The subject who mentally pictured Arthur Ashe was a black student. Ashe had been one of two performers the subject had seen play on television. It is of interest to note, that of the two performers, this subject identified with Ashe. This finding makes one wonder if this subject would have identified with Althea Gibson if she had seen her. This possibility is certainly worth consideration. Refer to Table 19 for further information.

All four subjects in this image group pictured their imaged performer and Mary Slaughter performing the forehand drive on the tennis court. Three subjects' mental image remained unchanged with regard to this information. The other subject's final mental image became more specific in detail of exact location of the performance on the court. The final imaged performance was visualized near the baseline of the
TABLE 19
SUMMARY OF MENTAL IMAGE IDENTITIES AND VANTAGE POINTS

Mental Image: Known Performer and Mary Slaughter

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mental Image Vantage Point</th>
<th>First Mental Image Identity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Side-45°</td>
<td>Front Arthur Ashe</td>
</tr>
<tr>
<td>10</td>
<td>Front</td>
<td>Side-45° Roommate</td>
</tr>
<tr>
<td>11</td>
<td>Behind</td>
<td>Front Boy Friend</td>
</tr>
<tr>
<td>13</td>
<td>Side-45°</td>
<td>Front Instructor (investigator)</td>
</tr>
</tbody>
</table>

court. The other subjects' imaged performance was indicated to be in the back court or right back court throughout the study.

At the onset of this research all four subjects in this group provided information about the ball flight in their mental image. Only three of these subjects actually saw the ball being hit. However, the description of ball flight as being fast and low remained constant throughout the project. It is of interest to note that two subjects did not see the ball actually cross the net. This finding might be explained by the fact that their mental image vantage point was initially from the side at a 45 degree angle which would not necessarily allow the subject to see the ball past a certain point. Ball flight seemed to be well established, however, which would indicate a potential for an efficient and effective forehand drive.

Information obtained by the Essential Elements Checklist indicated every subject in the Known Performer-Mary Slaughter Image Group did not have all of the essential elements incorporated in their first mental
images. Throughout the study two of the subjects visualized the ball being in contact with the racquet a short period of time. One of the two remaining subjects' first image pictured the ball being in contact with the racquet a medium length of time and the other a short time. At the conclusion of the investigation, both subjects pictured the ball to be in contact with the racquet a long time or as long as possible.

Tuning in to the ball was not part of two subjects' first image. The other two subjects initially visualized their mental image as being tuned in to the ball until racquet-ball contact. At the conclusion of the study three of the subjects pictured their mental image as watching the ball constantly or until racquet-ball contact. The fourth subject still could not provide information about the tuning in process. It would seem that three of the subjects in this image group improved this aspect of their mental image while one did not report any change.

The stroke quality pictured by this image group seemed to be well developed throughout the study. All subjects consistently pictured the stroke in their image as being smooth, coordinated, relaxed, and controlled. Very little change, if any, occurred in the quality of this group's images. It is of interest to note the well established quality of the performance considering the limited previous experience of the group. On the basis of previously discussed findings it is possible that those subjects with limited previous background start with a well developed image in regard to quality and refine other aspects of their mental image. After six to eight weeks experience, improvement in quality of performance seems to take priority. At least the findings of this investigation seem to indicate such.
Racquet - body - ball alignment did not change with one subject. She pictured the ball as being played slightly in front of the body throughout the study. Two other subjects initially pictured the ball being played slightly in front of the body. Their final imaged performer played the ball even with the middle of the body. The other subject experienced a reversal in this pattern.

Two subjects' first imaged performer started the backswing when the ball crossed the net. The other two subjects initially saw the backswing starting as the ball left the opponent's racquet. At the conclusion of the investigation one subject visualized the backswing starting as the ball was released from the ball boy machine and the other one as the imaged performer moved into position to play the ball. The subjects who initially pictured the backswing as starting when the ball crossed the net improved this aspect of their mental image. At the end of the study they pictured the backswing starting as the ball came off the opponent's racquet. The Eastern grip remained constant throughout the study for two subjects. One of the other subjects' image first was pictured with a Western grip but changed to an Eastern grip in the final image discussed. The other subject could not identify the grip used by her imaged performer initially. The Eastern grip was visualized at the conclusion of the investigation.

Aspects of mental images of the Known Performer-Mary Slaughter Image Group seemed to improve slightly during this investigation. The most noticeable change seemed to occur with a transition in vantage point and the acceptance of a new imaged performer.
The four Known Performer-Mary Slaughter Mental Image subjects viewed the demonstration films a total of forty-one times or an average of ten times per subject. All subjects indicated use of the films was the single factor which contributed most to the development of their mental image of the forehand drive. See Table 20 for individual use of films.

The fact that all subjects in this group's mental images changed from someone they knew to Mary Slaughter strongly supports the acceptance of the model in the demonstration films.

One subject in this group reported the films had improved her mental image and skill performance only slightly. The other three subjects indicated their mental images had been greatly improved by watching the demonstration films. Two of these subjects also believed the films had helped to improve their skill performance very much. The other subject indicated a slight change in skill performance as a result of the films.

All subjects in this image group indicated their mental image performance to be better than their own skill performance. Initially one of the four subjects indicated there was very little difference between the imaged performance and her own. At the conclusion of the study this subject assessed her mental image to be much better than her skill performance. In the final analysis one subject who initially indicated her mental image to be very much better than her skill performance indicated her image to be only slightly better. All these subjects believed their comparison of mental image and skill performance to be accurate.
TABLE 20

SUBJECTS ACTUAL USE OF DEMONSTRATION FILMS

Mental Image: Known Performer to Mary Slaughter

<table>
<thead>
<tr>
<th>Subject</th>
<th>Side 90°L</th>
<th>Side 45°L</th>
<th>Front Diagonal</th>
<th>Above 45°L</th>
<th>Behind</th>
<th>Rallying</th>
<th>Total Use of all 6 Films</th>
<th>Single Factor Contributing Most to the Development and/or Improvement of Mental Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>2</td>
<td>2</td>
<td>*2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>12 Films</td>
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<td>10</td>
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<td>3</td>
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<td>13 Films</td>
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<td>11</td>
<td>1</td>
<td>2</td>
<td>*1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>8 Films</td>
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<tr>
<td>13</td>
<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>*3</td>
<td>8 Films</td>
<td></td>
</tr>
</tbody>
</table>

Note: #10 could not identify a most helpful film
The data collected relative to this image group seems to indicate slight improvement in skill performance for two subjects. This assessment seems to correlate with judges' ratings. The subject who reported her mental image and skill performance had improved a great deal seems to be in agreement with the judges' ratings.

**General Hypothesis**

The general hypothesis of this study was that the more complete and detailed the mental image regarding essential elements of a particular skill, the more effective and efficient would be the performance of that skill. The findings of this study do seem to support this hypothesis and have already been discussed in detail.

In addition to investigating this general hypothesis, the following additional questions were explored to gain greater insight into aspects of one's mental image as it is related to learning and skill performance.

1. Is the performer in the mental image (picture) that of the subject or someone else? On the basis of the results of this investigation one's mental image might be self, an unknown performer, a known performer, or the model performer in the demonstration films. The findings of this research also indicate that one's mental image performer might remain the same or it might change over a period of time.

2. From what angle or position is the skill being performed? (Is the imaged performer viewed from the side, the back, the front, from above, or from within the eyes of the performer?) Individual mental image vantage points included all of the above examples. Findings of this study indicate that mental image vantage points might change or they may
remain the same over a period of time. A consistent change noted in vantage point was the reversal from a side view to a front view and vice versa.

3. Is the skill being performed on the tennis court in relationship to the net and/or opponent? If not, what is a part of the mental image other than the performer executing the skill? All subjects who participated in this study mentally pictured their imaged performances as taking place on the tennis court. The majority of subjects indicated the performance to take place near the baseline and/or toward the right side of the court. Very few subjects included the net and/or opponent as part of their mental image. Two subjects reported the ball boy machine was part of their mental image.

4. Is the mental image the same as or different than the subject's own skill performance? To what degree is there a difference? The majority of subjects indicated their mental image was much better or very much better than their skill performance. Very few subjects indicated the mental image to be the same as skill performance. More subjects indicated a sameness in image and skill performance initially than at the conclusion of the study.

5. Will providing the model of an expert skill performance change the mental image of an individual learning a skill? The majority of subjects indicated viewing the six demonstration films did change their mental image and improved their image in detail and accurateness. The degree to which subjects' mental image improved and became more accurate varied from slight improvement to great improvement.
6. If a positive change occurs in mental image toward a more accurate and complete mental image of the forehand drive, will a positive change also occur in the skill performance toward a more effective and efficient performance? Twenty-one of the twenty-four subjects participating in this investigation experienced an improvement in skill performance regarding the number of successful shots played during the videotaping sessions. The Judges' Ratings did not always reflect an improvement in performance based upon the criteria set forth in the Essential Elements Checklist. However, little or no change in Judges' Ratings does not necessarily mean that performance did not improve. Changes in viewing subjects from different vantage points as a result of change in mental image vantage point possibly influenced this outcome. It should also be recognized that it is entirely possible that slight changes which occurred in skill performances were so slight that individual judges' ratings did not reflect the improvement.

In summarizing it would appear from the findings of this research that there is a relationship between an accurate mental image and an efficient, effective skill performance of the forehand drive. The relationship seems to be stronger with particular image groups. Demonstration films of an expert performer do appear to make a positive contribution to the development and/or improvement of one's mental image. From the findings of this study it can be concluded that it is possible to effect a change in mental image by using demonstration films of an expert performance. Specific conclusions of the study will be discussed in detail in Chapter V.
CHAPTER V

SUMMARY AND CONCLUSIONS

Introduction

This study was designed to obtain and analyze mental image and skill performance data of women students enrolled in beginning tennis classes. The primary purpose of the research was to determine the relationship between mental image and skill performance of the forehand drive. In addition, a comparison of mental image and skill performance was made to determine if they were the same or different.

Several instruments were designed by the investigator to assess mental image and skill performance. Mechanical aspects of mental image of the forehand drive were determined by the Essential Elements Checklist. Other components of mental image were determined by an Introspective Analysis. Subjects were interviewed to determine their mental image vantage point of the forehand drive and to collect other pertinent data. After the first interview, all subjects were videotaped performing the forehand drive. Immediately following the videotape performance, subjects watched their own performance and compared it with their mental image. In between the first and final videotaping session subjects were asked to view six demonstration films of an expert performance to develop a better conceptualization of the skill. At the conclusion of the study subjects were re-interviewed and re-videotaped to determine if any changes
had occurred in mental image and/or skill performance. Three judges viewed the two videotaped performances twice and rated the skill performance on the basis of the criteria established in the Essential Elements Checklist. Judges' ratings were compared with subjects' skill performance improvement scores and frequency of film viewings to determine if a relationship existed between them. Judges' ratings were also compared to establish the intra-judge and inter-judge reliability and were found to be significant. The Kendall Coefficient of Concordance was computed to determine the degree of agreement among judges' ratings. This correlation was significant beyond the .001 level of significance.

Findings and Conclusions

Six mental image categories were identified as a result of this study. Those mental image categories were Self and Self, Self and Someone Else, Self and Mary Slaughter, An Unknown Female and Self, Someone Unknown and Someone Unknown, and Someone Known and Mary Slaughter.

Use of the Introspective Analysis I and II revealed that subjects are capable of reporting information about their mental image of the forehand drive. Use of the Essential Elements Checklist does indicate the accuracy and details of mental image of the forehand drive.

According to Introspective Analysis II the use of demonstration films of an expert performer can effect a positive change in mental image of the forehand drive. The analysis also indicated that change not only occurs in regard to the detail and accurateness of mental image, but personal vantage points of one's mental picture also are subject to change over a period of time. It should be noted that all subjects did not mentally picture self, and image identity is also subject to change. Change
in mental image was not the same for all subjects and changes occurred in varying degrees.

Subjects who pictured self as the performer in their mental image reflected the most numerous changes in their mental images. This finding might be related to two facts. Seven of the nine subjects in this image category had no previous experience in tennis and were in an early stage of developing their mental images. The other fact worth noting is the identity of self. The investigator found it interesting and puzzling, in some respects, to find self as the image identity considering the lack of previous experience. This finding might indicate some relationship between one's self concept and positive feelings about skill ability. This possibility would be worth investigation since no attempt was made to determine or measure self concept of the subjects in this study.

Findings related to the Self and Self Mental Image Group also seem to indicate that motivation changes among subjects are more frequent than among subjects who did not identify self in their mental image. Motivational level of other mental image groups remained constant throughout the study.

Subjects who identified the performer in their mental image as an unknown identity throughout the study revealed the fewest changes in their mental images. These subjects also had six to eight weeks previous experience in tennis. This finding seems to indicate that previous experience engraves a more permanent image in one's mind of a particular skill. This image seems less likely to change than subjects who have had no previous experience. This finding seems logical and should be expected.
The major hypothesis of this study was that the more complete and detailed the mental image regarding essential elements of a particular skill, the more effective and efficient will be the performance of that skill. Findings of this investigation support this hypothesis.

Additional findings were:

1. It can not be assumed that the performer in one's mental image is self or that the image visualized is completely accurate.

2. Mental images are not visualized from the same vantage point by all individuals.

3. It is possible to effect a change in mental image by using demonstration films of an expert performer.

4. Positive change in mental image is accompanied by a positive change in performance.

5. The use of demonstration films is not the only most important factor identified as effecting change in one's mental image.

6. Developing a more accurate mental image does help improve performance of the tennis forehand drive.

Implications of the Research

The findings of this investigation suggest several implications for the teaching — learning process. It would seem worthwhile and beneficial to develop more instruments that will assess students' mental images of sport skills. This implies that future teachers should receive more emphasis on the techniques of developing mental aspects required for teaching sport skills. Before one can expect to effect positive change in mental image, one must first identify and assess that image. If teachers could assess mental image and skill performance the deficiencies
in both areas might be eliminated to enhance learning and skill development.

Since there are many modalities that can effect learning, it might be wise to determine the modality by which individual students learn best and allow learning to occur through that means. Emphasis of one modality is not enough in the learning situation. For example, if a student is verbally oriented, use of visual techniques alone may very well be inadequate to enhance the learning process and skill development of that student.

Findings of this research suggest that more freedom of choice in using learning materials should be provided students. Not all materials will be effective or useful to all students. In light of this fact, a variety of materials should be provided in a learning situation. These learning materials should be geared to several learning modalities.

Demonstrations and demonstration films should include a variety of viewing vantage points as the information available from different vantage points varies. Viewing a skill from the side as opposed to seeing it from behind provides a limited amount of information. Seeing the end result of a skill seems to be equally as important as seeing the form and techniques involved.

It is the belief of the investigator that many demonstrations encourage students to view a skill as a spectator rather than as a performer. If skilled movements are to be internalized the total concept of the skill must be taught. This statement indicates students must be afforded the opportunity of viewing a demonstration from a vantage point that allows maximum information about the total skill. At some point in
the learning process the end result of an efficient, effective performance must be provided. End result of a skill clearly defines the goal or objective of that skill. Hitting a tennis ball over the net is one thing. However, hitting a low, fast ball over the net to the baseline or back corner clearly defines and refines the target and/or goal of the performance. Physical educators must become more adept in providing specific targets or goals during the learning process. Targets and goals must be established in relation to each student's abilities as well as a group's abilities. In other words, generalities will not profit all students. Specific aspects of mental image as they relate to skill performance must be identified and developed and/or improved.

**Suggestions for Further Research**

Relatively little research has been conducted in physical education dealing with mental image. Evidence from this investigation and two other studies conducted by DeBacy\(^1\) and Schick\(^2\) indicates the need to identify mental image and its components. In addition it seems appropriate and necessary to find various methods of developing accurate mental images of sport skills.

Another area needing consideration and attention of further research is the learning material provided students. How should it be organized and structured to result in optimal gains in mental image development and skill performance?

An extension of the present study might involve assessment of learning modalities and the provision of learning materials emphasizing

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1. DeBacy, *op. cit.*
2. Schick, *op. cit.*
those modalities to determine if there is a relationship between performance improvement and learning modality. An exploration of learning modalities desired by individuals might provide valuable information which would further enhance teaching methods.

It would seem appropriate to also investigate differences in skill learning when students are provided with learning experiences which focus on the end result of a particular skill as opposed to learning experiences which focus on technique and form. At the same time a combination of emphasis on the end result and form could be evaluated.

Another area of research deserving consideration is a comparison of the impact of a live demonstration versus a videotaped or film demonstration upon the learning of sport skills. This research should also attempt to include students who are visually oriented to determine the real value of demonstrations upon learning physical education skills.
APPENDIX A
INSTRUCTIONS TO SUBJECTS

I. Basic Introduction to Study

You have been selected to participate in this study from a group of students taking beginning tennis because you indicated a willingness to participate in the project. You were selected at random among those students who volunteered their services and participation.

This study is being done to help determine the inner reactions of students to the learning process in tennis. It is important that you express your own feelings and your own reactions. There is no correct or incorrect response or reaction to any question or to any aspect of this study. Each individual subject is to be treated as such and should feel completely free to exercise all individual thoughts, reactions, and responses. Involvement in this study will help reveal to the investigator student response and reactions to the learning process involved in acquiring skill in tennis. Hopefully, information gained as a result of this study will provide guidelines for further research to improve the teaching-learning process involved in learning sport activities.

II. Procedures

Each subject will be interviewed relevant to her present knowledge and information about the forehand drive in tennis. After the first interview each subject will be videotaped performing the forehand drive. Following the videotaping session each participant will be allowed to view her own performance.

Following the videotaping each subject will be allowed to proceed with independent learning and study. To facilitate this process a series of six films have been developed for your use in learning more about the
forehand drive. For the purpose of this study it is important that you view each film at least one time. (Each film runs about 1/2 to 2 minutes in length.) From that point you are free to select the film or films that are most helpful to you and continue to use them. You are strongly encouraged to continue to use the films until they are no longer beneficial to your gaining of knowledge and learning. In addition to the films you are encouraged to read the article "Essential Elements of Good Tennis Form" by Dr. John Hendrix to supplement your learning and understanding of the skill being studied. If you desire additional resource materials, a number of texts in the area of tennis may be found in the WRA room in the Association Building. If you desire personal help from the investigator in answering questions or in analyzing the films you are encouraged to pursue that help. If you would like to view the films with other subjects participating in the study you are encouraged to do so. The freedom to learn as you choose is completely available to you as you participate in this research study. There are no limits to the freedom you have. This is truly an opportunity for self-directed learning with an opportunity to express your own feelings relevant to the learning situation, instructional media, and resource materials.

When the learning materials cease to be of value to you, your participation in the study will be terminated with a final interview and videotaping of your performance. Since it is recognized that all individuals learn differently and at varying rates of speed and by different means, it is not expected that all subjects complete their participation at the same time. Therefore, feel free to spend as long as you like in the next seven weeks to use the materials made available to you.
Your cooperation, participation, and interest in this research project is very much appreciated. It is hoped that your participation in the study will be meaningful and worthwhile to you and that it will be a means by which your learning of tennis will be enhanced.

Karol Anne Kahrs
Women's Physical Education
Department
Otterbein College
Westerville, Ohio
September 29, 1971

Dear

At this time I would like to express my sincere appreciation to each one of you for your prompt and understanding cooperation this week with your interview and videotaping session. Your promptness and consideration were deeply appreciated. It has been my pleasure to have such kind and thoughtful subjects participate in my study. You have all been a tremendous help and I do appreciate your participation and interest.

Now that the first interview and videotaping sessions are over you are to use the films in the Learning Resource Center and any other learning materials made available to you. Feel free to make an appointment with me for any questions which you might have or for any help which you desire.

If for any reason you do not have a Film Record Sheet please see me to get one. If you have misplaced your Film Record Sheet please don't be shy about asking for another one. I sometimes misplace things myself so I do understand!

Thank you again for your conscientious efforts and I am looking forward to working with you throughout the remainder of the research project.

Sincerely yours,
To: Subjects Participating in Miss Kahrs Research Project for Ph.D. Dissertation

From: Miss Kahrs

Date: October 27, 1971

Dear

It has been one month since you began your participation in my research project concerning the learning of tennis. It is hoped that since none of you have as yet terminated your participation, that you are still actively using the films and are improving your skills and knowledge outside of regular class meetings. Since November is almost here I would like to take this opportunity to thank you for your time and efforts and encourage you to concentrate your efforts in the next weeks to make maximum use of the demonstration films and article entitled "Essential Elements of Good Tennis Form". By November 2, you should have made an appointment with me to be re-interviewed and re-videotaped so that I may conclude my collection of data before the end of the term.

Your cooperation in finishing up your independent study and learning will be most appreciated. Your maximum and best efforts at this point are essential to obtaining valid results with my data and to the completion of my degree.

Thank you again for your cooperation and participation.

I shall expect to make your appointments for interviews and videotaping sessions no later than November 2. November 3 - 12 will be used to complete interviews and videotaping. The time involved for each subject will be the same as the first interview and videotaping session.

Sincerely yours,

Miss Kahrs
APPENDIX B
FILMING POSITIONS FOR DEMONSTRATION
FILMS AND VIDEOTAPEING OF SUBJECTS

Ball Boy Machine

Tennis Club

Roof

Height 16'

Scale 1/16" = 1'

Filming Positions

A = Front
B = 90° angle
C = 45° angle

D = Back
E = Above playing court at
    45° angle
F = 45° angle (Subjects only)
ESSENTIAL ELEMENTS CHECKLIST FOR TENNIS FOREHAND

Name__________________________________________________ 1st Interview____

Date_________________________Time____________________ 2nd Interview____

1. A thrust through the ball

How is a thrust through the ball achieved?

Optional question: How long does the ball remain in contact with the racquet?

____ By remaining in contact with the ball as little time as possible.

____ By remaining in contact with the ball a short period of time.

____ By remaining in contact with the ball as long as possible.

____ Other (Identify)

2. Tuning in (visual concentration on the ball)

How is the ball tracked or visualized?

Optional question: How long does your mental image watch the ball?

____ The ball and only the ball is actually watched until it is contacted by the racquet.

____ The ball is not watched until it comes into contact with the racquet.

____ The ball is watched only as long as necessary to determine its direction and the position on the court from which it should be played.

____ The ball is the main object of visualization in playing a forehand drive.

____ Other (Identify)

3. Absence of tension

How would you describe the quality of the stroke?

____ The stroke is made in a relaxed manner and free from excessive or limiting tension.

____ The stroke is made in a somewhat obviously tensed manner.
The stroke is made in a smooth and coordinated movement.
The stroke is made in a jerky somewhat awkward manner.
Other (Identify)

4. Continual adjustment (racquet-body-ball alignment)

In relationship to the body, where is the ball contacted with the racquet?

- Slightly in front of the body.
- Even with the front foot.
- Even with the center of the body.
- Even with the back foot.
- Slightly behind the body.
- Other (Identify)

5. Early backswing

When does the backswing occur in preparation for the stroke?

- The backswing begins as the player moves in position to play the ball.
- The backswing begins as soon as the ball comes off of the opponent's racquet.
- The backswing begins when the ball bounces within reach of the racquet.
- Other (Identify)

6. An efficient grip

Can you describe or demonstrate the grip used in executing the forehand?

- Continental grip (racquet face is slightly open)
- Eastern grip (racquet face is parallel to the net)
- Western grip (racquet face is slightly closed)
- Other (Identify)

7. Other information pertinent to mental image.
INTROSPECTIVE ANALYSIS I

Name__________________________________________Interview: (1)(2)

Date______________________________Time________________________

1. Who is the performer in your mental image (picture)?
   ______ Self
   ______ My Instructor
   _____ Someone I know-Who? _______________________________
   _____ Someone I don't know
   _____ A highly skilled performer - male_____ female____
   _____ Someone who does not have a face
   _____ Other (Identify)

2. From what angle or position is the skill being viewed in the performance in your mental image?
   _____ From the front
   _____ From the side-90°
   _____ From the side-45°
   _____ From behind
   _____ From above
   _____ From within
   _____ Other (Identify)

3. Where is the performer executing the skill?
   _____ In open space in relationship to no particular environment
   _____ On the tennis court
   _____ On the court in relationship to the opponent
   _____ On the court in relationship to the net
   _____ On the court in relationship to net and opponent
   _____ Other (Identify)
4. To what degree are you motivated to participate in this study?
   _____ Highly motivated   _____ Low motivation
   _____ Above average     _____ No motivation
   _____ Average

5. Do you see the performer in your mental image actually hit the ball?
   _____ Yes           _____ No

6. If you see the performer actually hit the ball, what is its flight across the net?
   _____ Low and fast   _____ Do not see the ball flight
   _____ Low and slow   _____ Other (Identify)
   _____ High and fast
   _____ High and slow

7. Why did you volunteer to participate in this study?

8. How does your mental image (picture) compare with your own personal skill performance as recorded on videotape? (To be answered after viewing skill performance)
   _____ Mental image is the same as skill performance.
   _____ Mental image is better than skill performance.
      _____ Very much better
      _____ Much better
      _____ Slightly better
      _____ Very little difference
   _____ Mental image is poorer than skill performance.
      _____ Very much poorer
      _____ Much poorer
      _____ Slightly poorer
      _____ Very little difference
INTROSPECTIVE ANALYSIS II

Name_________________________________________Interview: (1)____(2)____
Date________________________Time____________________

1. Who is the performer in your mental image (picture)?
   ____ Self
   ____ My Instructor
   ____ Someone I know—Who?______________________________
   ____ Someone I don't know
   ____ A highly skilled performer—male____ female____
   ____ Someone who does not have a face
   ____ Other (Identify)

2. From what angle or position is the skill being viewed in the performance in your mental image?
   ____ From the front
   ____ From the side—90°
   ____ From the side—45°
   ____ From behind
   ____ From above
   ____ From within
   ____ Other (Identify)

3. Where is the performer executing the skill?
   ____ In open space in relationship to no particular environment
   ____ On the tennis court
   ____ On the court in relationship to the opponent
   ____ On the court in relationship to the net
   ____ On the court in relationship to net and opponent
   ____ Other (Identify)
INTROSPECTIVE ANALYSIS II (contd.)

4. To what degree are you motivated to participate in this study?
   ______ Highly motivated ______ Low motivation
   ______ Above average ______ No motivation
   ______ Average

5. Do you see the performer in your mental image actually hit the ball?
   ______ Yes ______ No

6. If you see the performer actually hit the ball, what is its flight across the net?
   ______ Low and fast ______ Do not see the ball flight
   ______ Low and slow ______ Other (Identify)
   ______ High and fast
   ______ High and slow

7. Why did you volunteer to participate in this study?

8. How does your mental image (picture) compare with your own personal skill performance as recorded on videotape? (To be answered after viewing skill performance)
   ______ Mental image is the same as skill performance.
   ______ Mental image is better than skill performance.
       ______ Very much better
       ______ Much better
       ______ Slightly better
       ______ Very little difference
   ______ Mental image is poorer than skill performance.
       ______ Very much poorer
       ______ Much poorer
       ______ Slightly poorer
       ______ Very little difference
INTROSPECTIVE ANALYSIS II (contd.)

9. Having been provided with a model of expert skill performance, what change if any, has occurred in your mental image?

____ It has remained the same
____ It has improved To what extent______________________
____ It has become poorer
____ Other (Identify)

10. If your mental image has changed by viewing demonstration films of an expert performer, what do you feel has happened to your own skill performance?

____ It has improved ______To what extent
____ It has remained the same
____ It has become poorer

11. What single factor has contributed the most to the development of your mental image of the skill? Rank the items in order of importance.

____ Reading material
____ Demonstration films
____ Watching other players whom you know
____ Demonstrations in class
____ Actual practice of the skill
____ Verbal instructions and coaching hints

12. What single factor has contributed the least to the development of your mental image of the skill?

____ Reading material
____ Demonstration films
____ Watching other players whom you know
____ Demonstrations in class
____ Actual practice of the skill
____ Verbal instructions and coaching hints
13. Which demonstration film was the most helpful to you?

___ Front
___ Side-90°
___ Side-45°
___ Behind
___ Above
___ Rallying

14. How accurate is your comparison of your mental image to your own skill performance?

___ Very accurate
___ Fairly accurate
___ Not very accurate
___ Not accurate at all
___ Not sure of the degree of accuracy

15. Why did you stop watching the demonstration films?

16. Which film did you choose to look at first? Why?

___ Front
___ Side-90°
___ Side-45°
___ Behind
___ Above
___ Rallying

17. Did you have a favorite or most helpful film?

___ Yes
___ No
___ Which one
18. Did anything about the films bother you? If so what?

19. Did you accept or reject the model who performed in the demonstration films?
   Accept ______  Reject ______

20. How could the films have been more valuable to you?

21. Comments or reactions to the films or to participation in the study
EVALUATION OF ESSENTIAL ELEMENTS CHECKLIST

I. Personal Information
   A. Name of Evaluator ______________________________
   B. Number Years Teaching Experience (Tennis) ______
   C. Number Years Competitive Experience _________
   D. Additional Qualifications of Authority
      ........................................................................
      ........................................................................
      ........................................................................

II. The essential elements which are identified in the checklist are congruent with those identified in the article "Essential Elements of Good Tennis Form", by Dr. John Hendrix. (Respond by checking the degree to which you agree or disagree with the statement.

   _____ Strongly agree
   _____ Agree
   _____ Neutral
   _____ Disagree
   _____ Strongly disagree

   Comments:______________________________________________
   ........................................................................
   ........................................................................

III. Please list any additional elements which you feel should be included in the checklist with appropriate rationale.

   ........................................................................
   ........................................................................
   ........................................................................
   ........................................................................
IV. Evaluate each essential element and corresponding question on the checklist relevant to the degree to which you agree or disagree with its inclusion and pertinence.

Check the appropriate coded response for each essential element and corresponding question.

Code:  SA - Strongly Agree  
       A  -  Agree  
       N  -  Neutral  
       D  -  Disagree  
       SD - Strongly Disagree

1. Essential element: A thrust through the ball  
   Question: How is a thrust through the ball achieved?

2. Essential element: Tuning in (Visual concentration on the ball)  
   Question: How long is the ball tracked or visualized?

3. Essential element: Absence of tension  
   Question: What is the quality of the stroke?

4. Essential element: Continual adjustment (racquet-body-ball alignment)  
   Question: In relationship to the body, where is the ball contacted with the racquet?

5. Essential element: Early backswing  
   Question: When does the backswing occur in preparation for the stroke?
6. **Essential element**: An efficient grip

**Question**: What grip is used in the stroke?

V. Rank checklist essential elements in order of importance. The number 1 should be assigned to the essential element which is most important, 2 to the element which is second in importance, and so forth with 6 being assigned to the least important essential element.

<table>
<thead>
<tr>
<th>Essential Elements</th>
<th>Rank Order of Importance</th>
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<tbody>
<tr>
<td>A. A thrust through the ball</td>
<td>______</td>
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<tr>
<td>B. Timing in</td>
<td>______</td>
</tr>
<tr>
<td>C. Absence of tension</td>
<td>______</td>
</tr>
<tr>
<td>D. Early backswing</td>
<td>______</td>
</tr>
<tr>
<td>E. Continual adjustment</td>
<td>______</td>
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<tr>
<td>F. An efficient grip</td>
<td>______</td>
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</tbody>
</table>
Dear ____________________,

In the fall of 1971 I would like to begin collecting data for my dissertation which is an investigation of the possible relationship between mental image and skill performance in tennis. As a part of this investigation I have developed an Essential Elements Checklist for the forehand drive to assist in the establishment of a subject's mental image of the skill involved. The checklist will also be used to record each subject's actual skill performance of the tennis forehand. A comparison will be made between image and skill performance to determine what similarities and/or differences exist. On the basis of the profiles established, reading material, and demonstration films of a highly skilled performer will be used to improve and further develop each subject's mental image of the forehand. At the conclusion of the treatment, mental image and skill performance profiles will again be determined so that a comparison can be made between the two. The general hypothesis of the study is that the more accurate the mental image of a particular skill, the more effective and efficient will be the performance of that skill.

At this time I would like your assistance in validating the enclosed checklist. You have been selected as an authority in the area of tennis based on the fact that you have ten or more years teaching experience in this sport. If you have also had competitive playing experience in tennis and/or other experiences to support authority in this area, I would appreciate your indicating such in the requested information.
LETTER TO JUDGES (contd.)

It would be most helpful if you would read the enclosed article "Essential Elements of Good Tennis Form" by Dr. John Hendrix and complete the requested information. You are asked to evaluate the degree to which the checklist is consistent with the article; to evaluate the degree to which you agree or disagree with the essential elements that have been identified; to include any additional essential elements which you feel should be included; and to rank the essential elements in order of their importance.

Your time and cooperation in completing the requested information would be most appreciated. For your convenience, a self-addressed, stamped envelope is enclosed. If at all possible, I would be grateful if you could return the requested information by August 1, so that I might make necessary revisions by September.

If for any reason you are unable to fulfill this request would you please return the materials in the enclosed envelope. Thank you very much for any time and consideration which you can give this request.

Sincerely yours,

Karol Anne Kahrs

encls.
JUDGES SKILL PERFORMANCE RATING FORM

Name of Judge__________________________________ Date____________________

1st Videotape Performance: Viewing session (1)____(2)____

Criteria to be Considered in Ratings

A thrust through the ball
Tuning in (visual concentration on the ball)
Absence of tension
Continual adjustment
Early backswing
An efficient grip

Rating Scale
0 - 50 total points

50 - 41 Excellent
40 - 31 Very Good
30 - 21 Good
20 - 11 Fair
10 - 0 Poor

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<tr>
<th>Subject</th>
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</tbody>
</table>
JUDGES SKILL PERFORMANCE RATING FORM

Name of Judge_______________________________________ Date____________________

2nd Videotape Performance: Viewing Session (1)____(2)____

Criteria to be Considered in Ratings

A thrust through the ball
Tuning in (visual concentration on the ball)
Absence of tension
Continual adjustment
Early backswing
An efficient grip

Rating Scale

0 - 50 total points

50 - 41 Excellent
40 - 31 Very Good
30 - 21 Good
20 - 11 Fair
10 - 0 Poor

Subject | Rating | Subject | Rating
--------|--------|--------|--------
3       | _____  | 1      | _____  
13      | _____  | 6      | _____  
8       | _____  | 20     | _____  
9       | _____  | 24     | _____  
11      | _____  | 21     | _____  
15      | _____  | 10     | _____  
19      | _____  | 22     | _____  
14      | _____  | 16     | _____  
18      | _____  | 5      | _____  
17      | _____  | 23     | _____  
4       | _____  | 7      | _____  
12      | _____  | 2      | _____  

SUBJECT'S SKILL PERFORMANCE RECORD

Subject ______________________________ Videotape: (1)___(2)___
Campus Address ________________________ Phone ____________
Date ______________________ Time ________

Scale 1/16" = 1'

Summary of Performance
Out of Bounds (Long) ___ Missed Ball ___
Out of Bounds (Wide) ___ Totals ___
Into Net ___ Successful Hits ___
Down Alley ___ Unsuccessful Hits ___
PARTICIPATION ASSESSMENT INVENTORY

Name__________________________________________Age________
Campus Address__________________________________________Phone____

1. Please indicate the number of weeks, months, or years of previous tennis instruction that you have had.
   Weeks_________ Months_________ Years_________

2. Please indicate if you play tennis during your leisure time.
   Yes_________ No_________
   If yes, how often do you play?
   Regularly_________ Occasionally_______ Seldom_________

3. Have you ever competed in an organized tennis tournament?
   Yes_________ No_________
   If yes, in how many tournaments have you participated?
   Indicate number__________

4. Do you play tennis right-handed or left-handed?
   Right-handed_________ Left-handed________

5. Why are you taking instruction in tennis?

6. Do you wear glasses? Yes_________ No_________

7. Would you be willing, if selected, to participate in a research project dealing with tennis?
   Yes_________ No_________
**PERSONAL RECORD OF FILM USE**

Name______________________ Age_____
Campus Address____________________ Phone_____

<table>
<thead>
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<th>Film and Number</th>
<th>Number Times Used</th>
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<tbody>
<tr>
<td>#1 - Forehand from the side-90°</td>
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<tr>
<td>#2 - Forehand from the side-45°</td>
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<tr>
<td>#3 - Forehand from the front of the performer</td>
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<tr>
<td>#4 - Forehand from above and to side-45°</td>
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<tr>
<td>#5 - Forehand from behind the performer</td>
<td></td>
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<tr>
<td>#6 - Forehand - Rallying in Game Play</td>
<td></td>
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</tbody>
</table>

Instructions: It is important that you keep an accurate count of the number of times which you view each film. Please just put a hash mark by each film number as it is used. Viewing the film each time is counted as a time used. Example. If you check a film out once and look at it six times, the film has been viewed six times. Example Nº 1
JUDGES QUALIFICATIONS

1. Judge A has had nineteen years teaching experience in tennis and has had extensive competitive experience for eight years. Judge A has coached tennis for six years.

2. Judge B has had fifteen years teaching experience in tennis and has had thirteen years extensive competitive experience. Judge B has coached tennis for eight years and is currently a teaching professional.

3. Judge C has had thirty-four years teaching experience in tennis and has had twenty-eight years extensive competitive experience. Judge C has coached tennis for twenty-two years and is currently a teaching professional. Judge C has been a teaching professional for thirty years.
BOOKS


Barnaby, John M. *Racquetwork: the Key to Tennis.* Boston: Allyn and Bacon, 1969.


ARTICLES AND PERIODICALS


UNPUBLISHED MATERIAL

Clifton, Marguerite A. "Mirrors of Movement," Purdue University, March, 1965. (Mimeographed)