

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

U·M·I

University Microfilms International
A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
313/761-4700 800/521-0600

Order Number 9222629

**The effect of three practice techniques on the accuracy of a
soccer penalty kick**

**Crossman, Brian Frederic, D.A.
Middle Tennessee State University, 1992**

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

THE EFFECT OF THREE PRACTICE
TECHNIQUES ON THE ACCURACY
OF A SOCCER PENALTY KICK

Brian Frederic Crossman

A dissertation presented to the
Graduate Faculty of Middle Tennessee State University
in partial fulfillment of the requirements
for the degree Doctor of Arts

May 1992

THE EFFECT OF THREE PRACTICE
TECHNIQUES ON THE ACCURACY
OF A SOCCER PENALTY KICK

APPROVED:

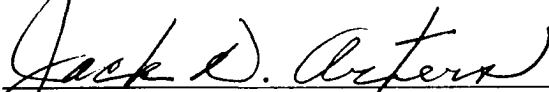
Graduate Committee:



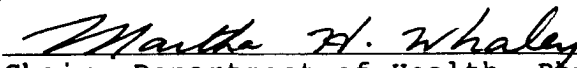
Major Professor



Committee Member



Committee Member



Chair, Department of Health, Physical Education, Recreation,
and Safety



Chair, College of Graduate Studies

ABSTRACT

The Effect of Three Practice Techniques on the Accuracy of a Soccer Penalty Kick

Brian F. Crossman

The purpose of this study was to investigate the effect of three practice methods on the learning of a soccer penalty kick. Thirty varsity level soccer players at Covenant College were tested at the beginning, midway and at the end of the practice sessions on the Crossman Penalty Kick Test (CPKT).

The subjects were put into three practice groups based on their pre-test scores. Each group was subjected to a different practice treatment for eight days. The three practice methods included: (1) internal imagery, (2) slow-motion mental practice, and (3) no practice (control).

The VAX 3900 system with MINITAB 7 at the Covenant College Information Processing Center was used to analyze the data. t-tests were used to measure the mean difference in each group for: (1) mean change #1 to mean change #2, and (2) mean change #3. A t-test was also used to measure change between low and high ability groups for mean change #3. A two-way Analysis of Variance was utilized to compare mean differences between ability levels from mean change #1 and mean change #2.

Brian F. Crossman

The results of the study showed: (1) significant differences for mean gain #3 for the internal imagery and slow-motion mental practice groups, (2) no significant differences for mean gain #3 for the control group and ability level groups, (3) significant difference from mean gain #1 to mean gain #2 for the internal imagery group, (4) no significant differences from mean gain #1 to mean gain #2 for the control and slow-motion mental practice groups, and (5) no significant difference was found between the low and high level ability groups when comparing mean gain #1 to mean gain #2.

In conclusion, internal imagery and slow-motion mental practice proved to be effective in learning a soccer penalty kick. Also, mental practice was of more benefit early in the motor skill learning process.

ACKNOWLEDGEMENTS

The writer would like to thank those individuals who assisted in the development of this dissertation. Appreciation is extended to the committee chairman, Dr. Glen Reeder, for constant support to press ahead. Thanks is also extended to Dr. A. H. Solomon and Dr. Jack Arters for their insights and encouragement. In addition, thanks to Dr. Douglas Sizemore for his assistance on the statistical treatment of the data.

A very special thanks goes to the writer's wife, Kimberlee, for her love, support, and time on the computer typing manuscripts. Thanks also to the writer's son, Zachary, who somewhat patiently waited out the numerous hours of computer work.

Finally, thanks goes out to the thirty Covenant College soccer players for their time and efforts in this study.

May the Lord Jesus Christ be glorified in all that this writer has undertaken during this study.

TABLE OF CONTENTS

	Page
List of Tables	iv
Chapter	
1. Plan of the Study	1
Introduction	1
Statement of the Problem	2
Purpose of the Study	2
Scope of the Study	3
Limitations of the Study	3
Delimitations of the Study	4
Basic Assumptions	4
Significance of the Study	4
Definition of Terms	5
Hypotheses	6
2. Review of Literature	8
Introduction	8
Soccer Studies	9
Imagery Related Studies	11
Ability Level	15
Timing of Learning	16
3. Methods	19
Selection of the Sample	19
Collection of Data	19
Description of the Instrument to be Used	19
Administrative Procedures	20
Skill Measurement (Pretest)	21
The Practice Phase	22
Internal imagery (II)	22
Slow-motion mental practice (SMMP)	24
No practice (NP)	25
Skill Measurement (Post Test)	26
Statistical Design	26

TABLE OF CONTENTS (CONT.)

4. Analysis of Data 28

 Introduction 28

 Results 29

 Hypothesis 1 29

 Hypothesis 2 30

 Hypothesis 3 30

 Hypothesis 4 31

 Hypothesis 5 32

 Hypothesis 6 33

 Hypothesis 7 34

 Hypothesis 8 35

5. Summary, Conclusions, and Recommendations 37

 Summary 37

 Conclusions 40

 Recommendations 40

APPENDIXES

A. Student Development Dean's Permission Agreement . 42

B. Middle Tennessee State University Human
 Subject Consent Form 43

C. Covenant College Student Consent Form 45

D. Test Procedure Chart 46

E. Daily Schedule 47

F. Test Scoring Form 48

G. Post Experiment Questionnaire 49

H. Test Data 50

I. Group Scoring Data 51

J. Ability Level Scoring 52

K. Post Experiment Questionnaire Data 53

REFERENCES 54

TABLES

Table	Page
1. Mean Change in Performance from Pre- to Post Test #2 for the Control Group	26
2. Mean Change in Performance from Pre- to Post Test #2 for the Internal Imagery Group	27
3. Mean Change in Performance from Pre- to Post Test #2 for the Slow-Motion Mental Practice Group	28
4. Mean Change in Performance from Pre- to Post Test #2 for Ability Level Groups	29
5. Comparison in Performance of Mean Change #1 and Mean Change #2 for the Control Group	30
6. Comparison in Performance of Mean Change #1 and Mean Change #2 for the Internal Imagery Group	31
7. Comparison in Performance of Mean Change #1 and Mean Change #2 for the Slow-Motion Mental Practice Group	32
8. Two-way Analysis of Variance between Ability Groups from Mean Gain #1 and Mean Gain #2	33

CHAPTER 1

Plan of the Study

Introduction

Physical educators are constantly searching for new methods to improve traditional techniques to develop the motor skill abilities of their students. The teacher should provide the students the best method(s) of practice/ instruction for the particular learning environment which confronts them. The physical educator often finds the teaching environment less than satisfactory with regard to time and facilities. Optimum use of the limited resources is of paramount importance to all educators. This situation demands the development of alternative teaching practices.

Motor skill acquisition is one area in learning of special interest to physical educators. The initial years of motor learning teaching involved the use of mass practice techniques (Singer, 1968). Individual learning differences were not taken into account. As motor learning matured as a sub-discipline, more research recognized the need for various practice styles to benefit motor skill acquisition (Schmidt, 1982).

The last fifty years have seen investigations on the use of cognitive processes to enhance motor learning. Numerous types of mental practice (MP) have demonstrated

varied success in motor skill acquisition (Corbin, 1972). Overall, there seems to be substantial support for the benefits of MP under certain conditions (Weinburg, 1982).

One sport which could possibly benefit from new practice strategies would be soccer. Soccer is the most popular sport in the world and is the fastest growing sport in the United States (Chyzowych, 1978). There is considerable interest on the part of the students but there is a lack of qualified teachers (Farries, 1979). Developing a modern approach for practicing soccer motor skills would promote the rate and quality of learning (Rote, 1978).

A specific investigation using several MP strategies in the learning of a soccer skill should help to solve the problem.

Statement of the Problem

This study investigated the relative effects of three practice methods upon the learning of a selected motor skill.

Purpose of the Study

The study determined students' ability to take an accurate soccer penalty kick. The specific purpose was to compare the mean change of: (1) pre-test to post test #2 and (2) pre-test to post test #1 and post test #1 to post test #2 having used three practice methods. A comparison between ability level groups was made. The three methods of practice were: (1) internal imagery (II), (2) slow-motion

mental practice (SMMP), and (3) no practice (NP).

Scope of the Study

Thirty male and female undergraduate students at Covenant College (Georgia) were used as subjects for the study. All subjects volunteered to participate in the study. The students were pre-tested on a soccer penalty kick for accuracy on the first day. The subjects were then divided into three groups of ten on the basis of their pre-test scores. The three groups were separated equally by the number of successful trials. After an introductory session, the groups were subjected to a different practice technique over the next four days. The practice period occurred once a day for a period of approximately fifteen minutes. The day following the fourth practice period, post test #1 was given to all the subjects. After four more days of practice, post test #2 was given to all the subjects involved in the study.

Limitations

The major limitations of the study were:

1. Due to the novel nature of the experimental instrument (Crossman Penalty Kick Test), test reliability and validity measures cannot be used;
2. The sample was restricted to students who were varsity level soccer players at Covenant College;
3. The practice period lasted only eight days;
4. The sample consisted of thirty subjects; and

5. The sample was restricted to those subjects who were present for all testing and practice sessions.

Delimitations of the Study

The major delimitations of the study were:

1. The research for this study was obtained from a non-classroom environment;
2. The exchange of test knowledge between the control and experimental groups was not controlled; and
3. There was no accurate measure for the amount of mental practice used by the groups during their practice periods.

Basic Assumptions

The limitations and delimitations mentioned previously in this chapter are based on several assumptions. They include:

1. The bias of the researcher did not influence the students' efforts during the study;
2. The MP groups used the MP technique during their practice sessions; and
3. The subjects' college varsity soccer team member status equated a moderate level of soccer skill.

Significance of the Study

The tremendous growth and interest in soccer in the United States has created a demand for effective methods to teach basic soccer motor skills. Research is needed in this area to provide new and better ways to practice kicking

accurately. This study substantiated mental practice as a viable alternative to the motor skill learning methods which have dominated the classroom through the years. In addition, this study hopes to promote further research in various areas of mental practice.

Recent trends in motor learning have shown a renewed interest in the use of mental practice. While studies from the early and mid-1900's centered on the relationship between mental and physical practice, the last few decades have seen numerous investigations comparing various types of mental practice (Feltz & Landers, 1983). An urging for more studies concerning differing MP instructions was noted by Richardson (1967b). There is a strong need for studies involving MP to be task specific under restricted conditions (Weinburg, 1984).

Definition of Terms

For the purposes of this study, the following definitions will be used:

Internal imagery (II) - this technique comes from a first person phenomenological perspective. A major characteristic of this technique is the incorporation of kinesthetic sensations in the imaging process.

Slow-motion mental practice (SMMP) - an external imagery technique combining relaxation, video-replay, and slow-motion imaginal practice. This technique is predominantly visual with a third person perspective.

No practice (NP) - this group will meet together but receive no soccer kicking skill information.

Hypotheses

For the purposes of this study, the following null hypotheses will be tested:

1. There will be no difference in mean kicking skill performance for subjects in the control group from pre-test to post test #2.

2. There will be no difference in mean kicking skill performance as a result of the internal imagery practice from pre-test to post test #2.

3. There will be no difference in mean kicking skill performance as a result of the slow-motion mental practice from pre-test to post test #2.

4. There will be no difference in mean kicking skill performance between ability level groups from pre-test to post test #2.

5. There will be no difference in mean kicking skill performance for subjects in the control group from pre-test to post test #1 and post test #1 to post test #2.

6. There will be no difference in mean kicking skill performance as a result of the internal imagery practice from pre-test to post test #1 and post test #1 to post test #2.

7. There will be no difference in mean kicking skill performance as a result of the slow-motion mental practice

from pre-test to post test #1 and post test #1 to post test #2.

8. There will be no difference in mean kicking skill performance between ability level groups from pre-test to post test #1 and post test #1 to post test #2.

CHAPTER 2

Review of Literature

Introduction

The practice and research of teaching motor skills has involved numerous strategies. Ultimately, each methodology has sought to discover the best way(s) to enhance motor skill performance. No one method has proven to be the perfect practice strategy (Drowatzky, 1981).

There have been many studies in the area of teaching methodology for motor skills. Unfortunately, there has been a lack of unanimity to the research. This inconsistency applies especially to investigations related to mental practice. Slightly over one hundred research studies on mental practice have been undertaken in the past sixty years (Feltz and Landers, 1983). In general, the literature has supported the use of mental practice for the acquisition of motor skills. A call for further research to identify specific variables and conditions where optimum performance growth will occur has been made by Richardson (1967a), LaLance (1974), Gould, Weinburg, and Jackson (1980), Drowatzky (1981), Schmidt (1982), Woolfolk, Murphy, Gottesteld, and Aitken (1985), and Maring (1990).

The review of related literature has been organized to provide a logical transition into the nucleus of the study.

Unfortunately, this chapter will be limited in the quantity of literature presented due to the scarcity of studies specific to soccer, imagery, ability level, and timing of learning for motor skill performance.

Soccer Studies

An investigation by Oxendine (1969) measured the effects of different schedules of physical, mental, and physical-mental practice on the learning and retention of three motor skills. A group of 212 seventh grade boys served as subjects. A soccer kick for accuracy with the non-preferred foot, a pursuit rotor skill, and a modified jump shot were the skills tested in the experiment. The study took place over seven consecutive school days. Four practice groups were used with different proportions of time allotted to physical and mental practice. A schedule of 50 percent physical practice and 50 percent mental practice was almost as effective as a schedule of physical practice only. The mental practice success was dependent upon: (1) task complexity, (2) task familiarity, and (3) physical ability.

Dirocco (1975) studied the effects of two teaching methods on six selected motor skills. A group of three-year old children (N=32) served as the subjects for this investigation. The subjects were divided into four groups of eight. The four practice groups included: (1) a control group, (2) a movement exploration group, (3) a direct skill instruction group, and (4) a combination group. A

pre-test/post test design was used to measure the mean gain in accuracy kicking, sidearm striking, throwing, body awareness, spacial perception, and directionality. The subjects met for three sessions per week lasting twenty minutes each for a period of six weeks. T-tests and Analysis of Co-variance were used to treat the data. No significant results were found at .05 level of confidence.

An investigation by Reams (1976) compared movement education and teacher directed methods of motor skill teaching to elementary students. Soccer, basketball, and softball skills were tested. There were twenty-five to thirty-three students in each class. The classes met five days a week for twenty minutes each day. Movement education proved superior to teacher directed physical education in all three sport skills.

A multimedia methodology was compared to a traditional style in teaching soccer skills by Rizk (1968). A four-item test battery of soccer skills was used to measure skill improvement. The subjects were fifty-eight male university students. The multimedia approach consisted of seven loop films, six films, and five filmstrips. The multimedia group scored significantly higher than the traditional group.

Phipps and Morehouse (1969) studied the effects of mental practice on the acquisition of three motor skills. The subjects were eighty male university students. The subjects met every other day for five days. The subjects

were split into control or mental practice groups for three selected skills. The skills tested were: (1) a soccer hitch kick, (2) a hock swing, and (3) a jump-foot. It was concluded that mental practice effectiveness is specific to the skill involved and is more prominent in less complex skills.

Imagery Related Studies

The effect of skill level on performance and muscle activity when using internal and external imagery was investigated by Harris and Robinson (1986). Internal imagery directed the subjects to experience the sensations and feelings associated with performing the task. External imagery involved subjects visualizing themselves executing the task. Videotaping of the subjects would be one example for using an external imagery technique. Internal imagery was more successful than external imagery in performing a karate movement. Advanced level students were found to respond better to imagery instructions. Greater skill level seemed to enhance the effectiveness of imagery.

A group of fifty college males was used to study the effect of certain cognitive behavioral techniques on a golf putting accuracy test by Woolfolk, et al (1985). The subjects were divided into six groups. These groups were: (1) positive outcome with performance, (2) negative outcome with performance, (3) performance only, (4) positive outcome only, (5) negative outcome only, and (6) the control group.

Pre/post test designs were used in a self-efficacy measure in a tension scale and for the golf putting test (twenty trials). A 3x2x2 ANOVA (outcome x performance x trials) measured the change in putting performance. The study produced results which supported the use of imagining the outcome of an athletic task just prior to that task, rather than imagining the motor movements of that task. Also, negative imagery caused a degradation of performance.

___ Epstein (1980) studied the effects of internal and external imagery and their impact on a motor skill when rehearsed immediately prior to attempting the skill. The seventy-five subjects were tested on the motor task of dart throwing. The subjects were randomly divided into a control group, internal mental rehearsal group, and external rehearsal group. The study was split into four steps: (1) assessment of imagery ability, (2) throwing of thirty darts, (3) combined mental rehearsal-dart throwing, and (4) post-experimental questionnaire period. A three-way ANOVA was used to treat the data. There was no significant difference involving the mental rehearsal variable.

An investigation using traditional and slow-motion mental practice in "putting" Frisbee golf discs was undertaken by Andre and Means (1986). The subjects were sixty-six male university students. A traditional mental practice technique was used on one group. A second group used a slow-motion rate of imagery. This technique was used

to enhance the vividness and clarity of the imagined motor skill. An attention placebo control group was given nominal task specific information. The practice period lasted for five days, twenty minutes per period. Pre/post scores were analyzed for the three groups using a 3x2 Ulrich-Pitz analysis of variance. All three groups had an improvement in their mean score. There was no significant difference between the experimental and control groups.

Powell (1973) studied the dart throwing ability of eighteen female students. The subjects were put into two equal groups as a result of their initial level of performance. Tight control over what the subjects did during their imagination or thinking time was highlighted during this study. Subjects who used positive imagining had a significant improvement from pre-test to post test. Subjects who used negative imagining showed a slight decrease in performance from pre-test to post test.

A group of thirty-nine male college students was used to study mental rehearsal as it affects tasks with a high motor dimension or a high cognitive dimension by Ryan and Simons (1981). Subjects were split into physical practice, mental practice, and no practice groups. The physical practice and mental practice groups had similar improvements for the predominantly cognitive task. The mental practice and no practice groups showed no improvement in the predominantly motor task. The imaging ability and frequency

of mental practice of the subjects were questioned by investigators.

Bradley (1975) studied three instructional methods on the improvement of badminton skills. The subjects were sixty-four college students enrolled in beginning badminton classes. The three instructional methods included: (1) videotape replay, (2) loop films, and (3) traditional. The instructional/practice period lasted five weeks with two sessions of fifty minutes each. An ANOVA was used to determine significance between groups. T-ratio was used to determine skill improvement within each group. There was improvement in all skill areas measured.

An investigation by White Ashton and Lewis (1979) studied the effects of physical and mental practice on an action-reaction swimming start. Twenty-four subjects were split into four groups of six. The four groups were: (1) mental practice, (2) mental practice and physical practice, (3) physical practice, and (4) control. The practice period lasted eight consecutive days. Each group practiced for a total of forty minutes. The group using a combination of mental practice and physical practice had the largest gain with the physical practice group having the next highest improvement. There was a high correlation between kinesthetic imagery ability and performance increase among those subjects in the mental practice groups.

Ability Level

Weinburg, et al (1980) investigated four practice strategies on a tennis serve. Twenty male and twenty female tennis players of different ability levels, ages fifteen to twenty-five participated in the study. The subjects were divided into four practice groups. The four practice groups included: (1) imagery (feel the movement), (2) positive comments (see yourself successfully completing the task), (3) attentional focus (concentrate solely on the skill), and (4) control (serve in usual manner). All groups improved except the control which scored about the same from pre-test to post test. The subjects of higher ability gave significantly better performances than subjects of lower ability.

A study by Noel (1980) looked at the effect of visuo-motor behavior rehearsal (VMBR) on tennis first serves during match competition. Fourteen male subjects were divided into two groups. One group used VMBR training ten days before competition. Group two was designated the control group. A small to moderate improvement was attained by the VMBR higher ability group. The lower ability VMBR group performance decreased after the treatment period.

Start (1962) investigated the effect of "games ability" on the learning of an underarm basketball throw. Thirty-eight individuals were subjectively assessed in "games ability" and assigned to above average, average, and poor

games groupings. The groups were then tested on an underhand basketball throw from a distance of fifteen feet. Following nine days of mental practice for five minutes each day, the subjects were re-tested. T-tests were used to check statistical mean gains between groups. The only group with a significant gain was the above average "games ability" group.

A group of 144 high school boys was tested on a one-hand foul shot by Clark (1960). The subjects were equated into physical and mental practice groups with experience level as one of the main criteria. Novice, junior varsity, and varsity were the three levels of experience used in the study. Five warm-up shots and twenty five practice shots were taken on fourteen consecutive school days. Mental practice was almost as effective as physical practice for the two more experienced groups. The novice mental practice group improved less than half when compared to the novice physical practice group.

Timing of Learning

An investigation by Singer and Witker (1970) measured the effects of timing on the pursuit rotor task of sixty-five college women. The subjects were split into five groups. The practice time lasted four weeks with two sessions per week. Mental rehearsal was introduced to each group at different points during the practice period. Although there were no significant differences between

groups, a trend showed mental practice to be more effective early in the practice period rather than later. This was true for same ability level groups within the context of overt practice.

Wrisberg and Ragsdale (1979) used two experiments to study the effects of mental practice on the stabilimeter (low cognitive demand) and the McCloy test of multiple response (high cognitive demand). Sixty right-handed male and female college students served as subjects for the first experiment. Eighty new subjects (right-handed male and female college students) were used in the second experiment. In experiment number two, the mental practice was used later in the practice period. The experiments each lasted four days with pre-testing and post testing done on days one and four respectively. A one-way ANCOVA showed mental practice as effective as physical practice only on the task with the high cognitive demand during early performance on the task.

One hundred and twenty right-handed male college students were investigated by Egstrom (1964) to determine the effect of conceptualization on the striking of a ball to a target with the non-preferred hand. The subjects were tested on the task the initial day of the experiment and randomly assigned to one of six groups. Each group then had five days of practice followed by a second test day. Five more days of practice was followed by a third and final test day. The practice groups consisted of one conceptualizing

treatment only, three combined conceptualizing-physical practice treatments, one physical practice treatment only, and a control group. The conceptualizing practice lasted five minutes and consisted of the subject concentrating his/her focus on the introspective rehearsal of the skill that was initially tested. Five of the six groups showed significant gains between tests one and two. The conceptualizing only practice group performed four times better between tests one and two than between tests two and three.

Chapter 3

Methods

Selection of the Sample

The subjects were thirty undergraduate students enrolled in classes at Covenant College on Lookout Mountain, Georgia during the spring of 1991. Volunteers were taken from the mens' and womens' soccer programs.

The subjects were split into three groups following the pre-test. The groups were divided equally according to their pre-test results. The subjects were not informed of the nature of the experiment until after post test #2 was completed.

Collection of Data

Description of the Instrument to be Used

The instrument used for this study was designed by the researcher. The name given this new motor skill test was the Crossman Penalty Kick Test (CPKT). The instrument was designed to replicate an actual skill movement used in the game of soccer. Previously designed motor skill tests for soccer did not fulfill the needs of this study. The CPKT began with the subject placing the soccer ball on a one-yard line parallel to a wall twelve yards away. Lines were taped on the wall distinctly outlining a goal and scoring area. Two scoring areas were designated by a taped line going from

the top of the goal to the bottom one yard inside each goal post. The subjects' task was to strike the soccer ball with their dominant foot and hit one of the designated scoring areas without the ball touching the ground.

Administrative Procedures

Prior to testing, the researcher was given permission from the Dean of Students at Covenant College to use students involved with the athletic department in the soccer program (see Appendix A). The Middle Tennessee State University Human Subject Consent Form was used to obtain necessary approval from the Research Ethics Committee for the Protection of Human Subjects (see Appendix B). Each subject signed a consent form (see Appendix C).

The researcher was assisted by a senior psychology student at Covenant College. The assistant aided in the scoring of the skill tests. In addition, the assistant helped with the administrative functions during the practice sessions.

All of the data were collected in the Barnes Physical Education Center on the campus of Covenant College. The main gymnasium and a classroom were used to conduct the experimental sessions. Each of the areas provided ample space, lighting, and ventilation for the scheduled activities.

On the initial day of the study the pre-test was given to all subjects. An information chart relative to the

testing procedures was posted immediately outside the testing area for all subjects to read (see Appendix D). On the second day the researcher met with all the subjects in an introductory session for fifteen minutes. The students were given the basic time parameters of the investigation to insure their priority scheduling for all practices and testing periods. A daily schedule was given to all subjects (see Appendix E). Subjects were encouraged to focus their full attention on whatever task was required of them. The subjects were also asked not to discuss anything about their involvement in the study until after post test #2 was completed. A description of the motor skill test procedures and scoring design was given at the meeting.

The day following post test #2, all subjects were brought together for a summation meeting. The basic research design, practice procedures, and general test results were given to the subjects. The subjects were then thanked for their time and efforts and dismissed.

Skill Measurement (Pre-Test)

The subjects were tested for accuracy in taking a soccer penalty kick before any practice occurred by means of the CPKT. A brief review of the test procedures and scoring was given to each subject before the testing began. This review lasted approximately one minute. The subject was allowed one warm-up kick before being evaluated on the actual test. After the warm-up kick, the subject was given

ten attempts. All subjects pre-test kicks were videotaped by the research assistant on a Magnavox VHS video camera. The camera focused in on the kicking motion of the subject and not the flight of the ball. Subjects were assured that the videotaping was for instructional purposes only and to pretend that the camera was not in the room. The researcher provided feedback regarding the success of the kick immediately following the ball hitting the wall area. The researcher marked the score sheet (see Appendix F) in the appropriate category after each kick was taken. The ability sections within each group were established by the subjects' pre-test successful number of trials. The two ability groups were: (1) 0-3 (low) and (2) 4-6 (high).

The Practice Phase

The day following the soccer penalty kick pre-test the subjects were split into three groups: (1) internal imagery (II), (2) slow-motion mental practice (SMMP), and (3) no practice (NP). Day 2 allowed for an introductory session for each group. Each group met the next four days separately for fifteen minutes for its practice sessions. After post test #1 occurred on day seven, there were four more days of practice. The experimental groups practice took place in a classroom in the Barnes Physical Education Center. The control group met for the same amount of time at the same location.

Internal imagery (II). Group 1 of the study was

treated during practice sessions with an internal imagery method. Each practice session consisted of the following procedures.

As the subjects came into the practice room they were told to get into a comfortable position on a 4'x 6' tumbling pad. A thirty second period of slow, deep breathing was used to help relax the subjects (Jacobson, 1938). Subjects were then told to see themselves taking a soccer penalty kick from behind their own eyes. Each subject was told to view the task from a first-person perspective and to incorporate kinesthetic sensations during his/her mental practice trials.

The practice session was then broken up into seven two-minute sections with a thirty-second relaxation period between the fourth and fifth sections. During each section the subjects were to visualize themselves taking two soccer penalty kicks paying special attention to specific body movements and positions. The seven sections were: (1) preparation, (2) approach steps, (3) plant foot, (4) kicking foot, (5) mid-body area, (6) upper body area, and (7) follow through of the kicking leg. At each one-minute interval the researcher would announce to the subjects which section they should be paying attention to within the framework of taking a mental soccer penalty kick.

A total of fourteen mental soccer kicks were taken each practice period by each subject. Over the entire practice

period, a total of 112 mental soccer penalty kicks were taken by each subject.

Slow-motion mental practice. Group 2 of the study was treated during each practice session with a slow-motion mental practice procedure. Each practice session was broken down into three time segments of five minutes each. The first five minutes were used to relax and watch a videotape replay of themselves (five kicks from their pre-test session) while seated in chairs. After all ten subjects had viewed themselves, they moved to a floor area covered by 4' x 6' tumbling pads. Each subject was told to get into a comfortable position on separate tumbling pads. A thirty-second period of slow, deep breathing was then used to help relax the subjects.

The second two five-minute phases of each practice session were nearly identical. The subjects were told to close their eyes and visualize themselves attempting a soccer penalty kick by generating a mental movie picture. The first trial was to be done at regular speed and then the next four trials using slow-motion. The regular speed trial was used to give subjects a reference point for their slow-motion mental practice. The researcher would give the command to begin at intervals of one minute. After the fifth trial a thirty-second relaxation period was given. During this time subjects were reminded to see themselves outside their body and pay attention to as much detail as

possible with each trial. This rest was followed by four more slow-motion mental practice trials at intervals of one minute. After the last slow-motion mental practice trial was completed, the subjects were aroused and dismissed for the day.

A total of fourteen mental soccer kicks were taken each practice period by each subject. Over the entire practice period, a total of 112 mental soccer penalty kicks were taken by each subject.

No practice (NP). The third set of subjects was used as a control group. This group met at the same location and for the same amount of time as the two experimental groups for the eight practice sessions. The subjects in the NP group took a seat in front of a video stand which contained a Hitachi television monitor and a Quasar VHS recorder. During the first twelve minutes of each practice session the subjects watched a videotape of the English Football Association Championship game from Wembley Stadium in London. The two teams in the 1990 final game were Everton and Liverpool, both members of the First Division in England's professional soccer league. The videotape was started the next practice session at the point where it was stopped the previous practice session. The last three minutes of each practice session were used by the subjects to write notes regarding the soccer action they saw that day. The subjects were asked to record their thoughts about

the offensive play (practice sessions 1, 3, 5, and 7) and the defensive play (practice sessions 2, 4, 6, and 8). There was nothing in this treatment that contained task specific information which could have assisted the subjects in performance enhancement of the Crossman Penalty Kick Test.

Both experimental groups were given post experimental questionnaires to assess the cognitive processes during the mental practice period (see Appendix G). The internal imagery and slow-motion mental practice groups each rated themselves above average for their mental process level during practice sessions (see Appendix K).

Skill Measurement (Post Test)

A post test was given to subjects on days seven and twelve. All procedures used for the pre-test were replicated for the post tests except no videotaping occurred.

Statistical Design

The data were collected, coded, and prepared for computer analysis at the Covenant College Information Processing Center. MINITAB 7.1 on the VAX 3900 System was used to analyze the data. t-tests were used to compare the mean changes for the II, SMMP, and NP groups from pre-test to post test #2 (mean change #3). t-tests were also used to compare mean changes for groups from pre-test to post test #1 (mean change #1) and post test #1 to post test #2 (mean

change #2). A t-test was used to compare mean changes for ability level groups from pre-test to post test #2. A two-way analysis of variance (ANOVA) was used to compare mean changes between ability level groups from pre-test to post test #1 and post test #1 to post test #2. The .05 level of confidence was used to determine the statistical significance of the data.

CHAPTER 4
Analysis of Data

Introduction

The purpose of this study was to investigate the relative effects of three practice methods upon the learning of a soccer penalty kick. The instrument used to measure the effects of the different practice treatments on the groups was the Crossman Penalty Kick Test (CPKT). The specific purpose of this chapter was to determine the amount of change for several groups at the half-way point and at the end of the practice period.

The subjects were college varsity level athletes who volunteered to participate in the study. The data collection procedure consisted of six phases: Phase 1, pre-test administration of the CPKT; Phase II, an introductory session; Phase III, four days of practice in the treatment groups; Phase IV, post test #1 administration of the CPKT; Phase V, four days of practice in the three treatment groups; and Phase VI post test #2 administration of the CPKT.

The data obtained from the three tests were then studied to determine significant differences for each practice group and ability level groupings. An unbalanced two-way analysis of variance and one sample dependent

t-tests were used to determine significant differences. The .05 level of significance was used for each hypothesis.

Results

The results of the data analyses are presented separately for each of the eight null hypotheses.

Hypothesis 1

There will be no difference in mean kicking skill performance for subjects in the control group from pre-test to post test #2.

Results of the study showed no significant differences at the .05 level between pre-test and post test #2 for the control group. The p value from the t-test treatment was 0.17 (see Table 1). Therefore the null hypothesis was accepted.

Table 1

Mean Change in Performance from Pre- to Post Test #2 for the Control Group

	N	Means	S.D.	t Value	p Value
Pre-test	10	2.80	1.68		
				-1.47	0.17
Post test	10	4.10	2.08		

* Significant at .05 level

Hypothesis 2

There will be no difference in mean kicking skill performance as a result of the internal imagery practice from pre-test to post test #2.

A t-test was used to treat the data to determine statistical significance at the .05 level. The t-test indicated a significant difference for mean scores of the pre-test and post test for the internal imagery group. The treatment produced a p value of .015 (see Table 2). Thus, the hypothesis was rejected.

Table 2

Mean Change in Performance from Pre- to Post Test #2 for the Internal Imagery Group

	N	Means	S.D.	t Value	p Value
Pre-test	10	2.80	1.48		
				3.00	.015*
Post test	10	4.80	2.25		

* Significant at .05 level

Hypothesis 3

There will be no difference in mean kicking skill performance as a result of the slow-motion mental practice from pre-test to post test #2.

A t-test was used to treat the data to determine statistical significance at the .05 level. The t-test indicated a significant difference for mean scores of the pre-test and post test #2 for the slow-motion mental practice group. The treatment produced a p value of .006 (see Table 3). Thus, the null hypothesis was rejected.

Table 3

Mean Change in Performance from Pre- to Post Test #2
for the Slow-Motion Mental Practice Group

	N	Means	S.D.	t Value	p Value
Pre-test	10	2.80	2.20		
				3.59	.006*
Post test	10	4.80	2.53		

* Significant at .05 level

Hypothesis 4

There will be no difference in mean kicking skill performance between ability level groups from pre-test to post test #2.

Results of the study showed no significant differences at the .05 level between pre-test and post test #2 for ability level groups. the p value from the t-test treatment was 0.26 (see Table 4). Therefore, the null hypothesis was accepted.

Table 4
Mean Change in Performance from Pre- to
Post Test #2 for Ability Level Groups

Ability Level	N	Means	S.D.	t Value	p Value
1 (Low)	17	2.18	2.16	-1.16	0.26
2 (High)	13	1.23	2.24		

* Significant at .05 level
df = 25

Hypothesis 5

There will be no difference in mean kicking skill performance for subjects in the control group from pre-test to post test #1 (mean change #1) and post test #1 to post test #2 (mean change #2).

A t-test was used to treat the data to determine statistical significance at the .05 level. No significant difference was found between mean change #1 and mean change #2 for the control group. The treatment produced a p value of 0.53 (see Table 5). Therefore, the null hypothesis was accepted.

Table 5
 Comparison in Performance of Mean Change #1
 and Mean Change #2 for the Control Group

Mean Change	N	Means	S.D.	t Value	p Value
#1	10	0.90	1.85		
				-0.65	0.53
#2	10	0.40	1.84		

* Significant at .05 level

Hypothesis 6

There will be no difference in mean kicking skill performance as a result of the internal imagery practice from pre-test to post test #1 (mean change #1) and post test #1 to post test #2 (mean change #2).

Results of the study showed significant differences at the .05 level between mean change #1 and mean change #2 for the internal imagery group. The t-test treatment produced a p value of .024 (see Table 6). Thus, the null hypothesis was rejected.

Table 6

Comparison in Performance of Mean Change #1 and
Mean Change #2 for the Internal Imagery Group

Mean Change	N	Means	S.D.	t Value	p Vaule
#1	10	2.20	2.25		
				-2.71	.024*
#2	10	-0.20	1.03		

* Significant at .05 level

Hypothesis 7

There will be no difference in mean kicking skill performance as a result of the slow-motion mental practice from pre-test to post test #1 (mean change #1) and post test #1 to post test #2 (mean change #2).

A t-test was used to treat the data to determine statistical significance at the .05 level. No significant difference was found between mean change #1 and mean change #2 for the slow-motion mental practice group. The treatment produced a p value of 0.43 (see Table 7). Therefore, the null hypothesis was accepted.

Table 7

Comparison in Performance of Mean Change #1 and Mean Change #2 for the Slow-Motion Mental Practice Group

Mean Change	N	Means	S.D.	t Value	p Value
#1	10	1.60	2.88	-0.83	0.43
#2	10	0.40	1.96		

* Significant at .05 level

Hypothesis 8

There will be no difference in mean kicking skill performance between ability level groups from pre-test to post test #1 (mean change #1) and post test #1 to post test #2 (mean change #2).

An unbalanced two-way analysis of variance was used to treat the data. Results of the study showed significant differences at the .05 level between mean change #1 and mean change #2 between ability groups. The p value for interaction ability groups and change level was .015 (see Table 8). Thus, the null hypothesis was rejected.

Table 8

**Two-way Analysis of Variance between Ability
Groups from Mean Gain #1 and Mean Gain #2**

Source	Sum of Squares	df	Mean Square	F	p Value
Ability level	3.29	1	3.29	0.80	.376
Change Score	26.16	1	26.16	6.32	.015*
Ability level* Change level	0.96	1	0.96	0.23	.632
Error	231.91	56	4.14		
Total	264.18	59			

* Significant at .05 level

CHAPTER 5

Summary, Conclusions, and Recommendations

Summary

The search for new and better practice strategies for motor skill acquisition is a constant struggle for physical educators. Meeting the specific needs of an ever diversifying student population in the educational arena demands innovative ideas. Limited physical facilities combined with larger classes calls for physical educators to cultivate undeveloped practice strategies. The use of cognitive processes in the form of mental practice to enhance motor skill acquisition is one such strategy.

The purpose of this study was to compare the mean change in the ability to take an accurate soccer penalty kick after being exposed to one of three practice methods. The practice methods used were: (1) internal imagery (II), (2) slow-motion mental practice (SMMP), and (3) no practice (NP). Each practice session lasted approximately fifteen minutes. A total of 112 mental kicks were taken by subjects in the two experimental groups (II and SMMP).

The procedures for data collection consisted of: (1) a pre-test of the Crossman Penalty Kick Test (CPKT), (2) an introductory session, (3) four days of practice, (4) post test #1 of the CPKT, (5) four days of practice, (6) post

test #2 of the CPKT, and (7) a summation meeting.

After the data were collected, it was prepared and coded for analysis at the Covenant College Information Processing Center. The data were analyzed on the VAX 3900 System with MINITAB 7.1. Students' t-tests were used to measure mean differences for the three groups for: (1) pre-test to post test #2; and (2) mean change #1 to mean change #2. A t-test was also used to measure change for ability levels (low and high) from pre-test to post test #2. A two-way analysis of variance (ANOVA) was used to compare mean differences between ability levels from mean change #1 to mean change #2. The .05 level of significance was used to test all hypotheses.

The results of the study were: (1) the control group (no practice) showed no significant difference from pre-test to post test #2; (2) a significant difference was demonstrated by the internal imagery group from pre-test to post test #2; (3) the slow-motion mental practice group showed significant difference from pre-test to post test #2; (4) no significant differences were found for ability level groups from pre-test to post test #2; (5) the control group demonstrated no significant difference from mean gain #1 to mean gain #2; (6) a significant difference was evident from mean gain #1 to mean gain #2 for the internal imagery group; (7) no significant differences were found for the slow-motion mental practice group from mean gain #1 to mean gain

#2; and (8) no significant difference was found between the low and high level ability groups when comparing mean gain #1 to mean gain #2.

These results were both supported and contradicted by previous investigations within this general area of study. The results that both experimental groups (internal imagery and slow-motion mental practice) had significant gains over the entire investigation period were consistent with findings from Oxendine (1969) and Bradley (1975). These findings were not supported by Ryan and Simons (1981) and Dirocco (1975). They found no improvement for the motor task after a mental practice treatment.

Regarding the comparison between the internal imagery (internal) and slow-motion mental practice (external) groups, there was no difference in their effect. Both groups showed significant improvement but one not more than the other. Studies by Egstrom (1964) and Harris, et al (1986) were not supportive and found internal mental practice techniques to be superior to external mental practice techniques. The results that neither group would have greater improvement than the other was supported by Epstein (1980) and Andre and Means (1986).

The results from this study showed no difference in the overall improvement between low and high level ability groups. Studies by Clark (1960), Noel (1980), Start (1962), and Barnes (1980) were not supportive. They all found that

the high level ability group achieved significant improvements. This study did reveal a significant improvement in the early practice stage for the low ability group. A Singer and Witker (1970) study supported this by demonstrating mental practice to be most effective early in the practice period.

Conclusions

The results obtained from the statistical analysis of this investigation led to the following conclusions.

1. Both the internal imagery and slow-motion mental practice methods proved to be effective in the learning of a soccer penalty kick.

2. Stronger positive values in the early stages of learning were found for the internal imagery group as compared with the slow-motion mental practice group. Internal imagery had a stronger effect on initial learning than slow-motion mental practice.

3. Higher positive values were found for the lower ability level during the initial stages of learning. Mental practice techniques were of more benefit to lower ability individuals early in the motor skill learning process than in the later stages.

Recommendations for Further Study

The results of this study warrant the need for further research within the area of mental practice and motor performance. The following suggestions for additional

studies are given to increase the breadth and depth of knowledge within this area of study.

1. A replication of this study to determine its validity.

2. Studies with well controlled laboratory conditions to minimize the inherent problems associated with imagery and mental practice.

3. A follow-up study is needed to investigate the importance of imagery skill development before the motor skill test and treatment period begins.

4. A follow-up study is needed using internal imagery and slow-motion mental practice techniques immediately prior to performance.

5. A study using different length treatment periods.

6. Similar studies (see recommendations three and four) should be conducted on the numerous variables affecting motor performance and their relationship on specific motor skills.

APPENDIX A

STUDENT DEVELOPMENT DEAN'S PERMISSION AGREEMENT

TO: SCOTT RAYMOND, DEAN OF STUDENTS

FROM: BRIAN CROSSMAN, ASSOCIATE PROFESSOR, PHYSICAL
EDUCATION

RE: PERMISSION TO INCLUDE STUDENTS IN RESEARCH STUDY

Thank you for agreeing to allow me to test thirty students the last two weeks of April, 1991. Your signature below will verify your willingness for thirty Covenant College students to be involved in the testing of a soccer motor skill.



Scott Raymond, Dean of Students
Covenant College
Lookout Mountain, Georgia

APPENDIX B

APPLICATION FOR PROJECT REVIEW FORM
BY THE
RESEARCH ETHICS COMMITTEE FOR THE
PROTECTION OF HUMAN SUBJECTS

Title of Project The Effect of Two Mental Practice
Techniques on the Accuracy of a Soccer
Penalty Kick

Name of Investigator Brian F. Crossman

Department Health and Physical Education

Date April 8, 1991 Date Expected to Begin Late April 1991

1. Give a brief description of the proposed project.
(attach additional sheet if needed).

The study will determine student's ability to take an accurate soccer penalty kick. The specific purpose will be to measure the amount of change in pre-test and post test results after three practice methods are used. The three methods of practice will be: (1) Mental Practice 1 (MP1), (2) (MP2), and (3) no practice (NP).

2. Give a brief description of the population
(subjects to be used), procedures and methods
to be used.

Thirty to forty-five male and female undergraduate students at Covenant College, Georgia, will be used as subjects for the study. The students will be pre-tested on a soccer penalty kick for accuracy on the first day. The subjects will then be divided into three groups of fourteen on the basis of their pre-test scores. The three groups will then be subjected to a different practice technique over the next four days. The practice period will occur once a day for a period of approximately fifteen minutes. The day following the fourth practice period, post test #1 will be given to all the subjects. After four more days of practice, post test #2 will be given to all the subjects.

3. On the following questions, circle the answer you feel best represents your project. If Yes, explain how, and how you propose to deal with it to protect the subject.

A. Are any risks pertaining to the subject's

- physical well being likely to occur? Yes No
- B. Do you expect any possible psychological or emotional risks? Yes No
- C. Will the responses or data be recorded in such a manner that the human subject can be identified? Yes No
- D. Could the data or responses, if they became known outside the research, reasonably place the subject at risk of criminal or civil liability or damage the subject's financial standing or employability? Yes No
- E. Does the research deal with sensitive aspects of the subject's own behavior, such as illegal conduct, drug use, sexual behavior or use of alcohol? Yes No
- F. Are you using a legally effective "informed consent" document for the subjects to sign? Yes No (Note: Such will be needed if the answer to any questions A - E is "Yes".)
- G. Do you have arrangements made or plans to provide for legal responsibility? Yes No
4. On the following questions indicate the type research activity you consider the project involves. Circle the answer(s).
- A. What is the type setting under which the experiment or tests are to be run?
1. Medical
 2. Physiological
 3. Educational Motor skill test
 4. Sociological
 5. Other _____
- B. If an educational setting, does it involve:
1. Educational instruction strategies or techniques
 2. Curriculum effectiveness
 3. Use of educational tests
 4. Survey or interview procedures
 5. Observation of public behavior
 6. Collection or study of existing data, documents, records, pathological specimens or diagnostic specimens

APPENDIX C

COVENANT COLLEGE STUDENT CONSENT FORM

I, _____, give my consent to take
(PRINT)
part in a thirteen day study involving a motor skill task
(soccer penalty kick). The test days will be April 15
(Monday), April 21 (Sunday), and April 27 (Saturday). The
test will take less than five minutes to complete. The
practice days will be from April 16 (Tuesday) to April 20
(Friday). The practice periods will last approximately
fifteen minutes. The practice methodologies will be
physically and mentally non-stressful. I commit to taking
part in each practice and test session.

Signature _____

Date _____

APPENDIX D

TEST PROCEDURE CHART

1. Lightly stretch: 1-2 minutes before testing time.
2. Enter testing area when beckoned.
3. You will be allowed one practice kick before your ten test trials are taken.
4. Take your time with each kick-try to be successful on each one.
5. Use your dominant foot for each trial.
6. The ball must hit in the designated target area on the fly for it to be a successful kick. Go for the same side of the target area each test time (right or left). Let the scorer know which side of the target area you are attempting to hit before you begin.
7. Remember to not discuss any of the test results or practice procedures with anyone until after the experiment is over on April 26th.

APPENDIX E

DAILY SCHEDULE

Day 1	Monday, April 15	Pre-test
Day 2	Tuesday, April 16	Introduction
Day 3	Wednesday, April 17	Practice
Day 4	Thursday, April 18	Practice
Day 5	Friday, April 19	Practice
Day 6	Saturday, April 20	Practice
Day 7	Sunday, April 21	Post test #1
Day 8	Monday, April 22	Practice
Day 9	Tuesday, April 23	Practice
Day 10	Wednesday, April 24	Practice
Day 11	Thursday, April 25	Practice
Day 12	Friday, April 26	Post test #2
Day 13	Saturday, April 27	Summation Meeting

APPENDIX F

TEST SCORING FORM

SUBJECT # _____

<u>PRE-TEST</u>			<u>POST TEST #1</u>			<u>POST TEST #2</u>		
	YES	NO		YES	NO		YES	NO
1.	Y	N	1.	Y	N	1.	Y	N
2.	Y	N	2.	Y	N	2.	Y	N
3.	Y	N	3.	Y	N	3.	Y	N
4.	Y	N	4.	Y	N	4.	Y	N
5.	Y	N	5.	Y	N	5.	Y	N
6.	Y	N	6.	Y	N	6.	Y	N
7.	Y	N	7.	Y	N	7.	Y	N
8.	Y	N	8.	Y	N	8.	Y	N
9.	Y	N	9.	Y	N	9.	Y	N
10.	Y	N	10.	Y	N	10.	Y	N

TOTAL	YES-	NO-	YES-	NO-	YES-	NO-
-------	------	-----	------	-----	------	-----

APPENDIX G

POST EXPERIMENT QUESTIONNAIRE

Group # _____

1. Overall, how well were you able to practice your penalty kicks with your mental processes during the eight practice sessions? Check one.

Poorly _____

Below Average _____

Average _____

Above Average _____

Excellent _____

2. Explain in detail why you evaluated yourself at the level checked in answer #1.

APPENDIX H

TEST DATA

Subject Number	Group Number	Ability Level	Pre-test	Post Test Number 1	Post Test Number 2
1	1	2	4	7	7
2	1	1	0	5	5
3	3	1	2	3	7
4	3	2	4	5	5
5	3	1	2	6	6
6	1	2	4	4	5
7	2	1	3	3	4
8	3	1	3	4	3
9	1	2	4	9	8
10	1	2	4	6	4
11	3	1	2	4	4
12	1	1	2	7	6
13	2	1	2	10	5
14	2	2	4	5	6
15	2	2	6	7	8
16	2	2	6	6	7
17	2	1	0	2	4
18	2	1	0	3	4
19	1	1	3	3	4
20	2	1	1	0	1
21	2	1	2	0	1
22	2	2	4	8	8
23	1	1	1	2	3
24	1	1	2	1	0
25	3	1	0	1	1
26	3	1	1	4	5
27	3	2	5	4	3
28	3	2	4	3	6
29	1	2	4	6	6
30	3	2	5	3	1

APPENDIX I

GROUP SCORING DATA

Group 1

<u>Subject #</u>	<u>Ability Level</u>	<u>Pre-test (x)</u>	<u>Post Test #1 (x)</u>	<u>Post Test #2 (x)</u>
1	2	4	7	7
2	1	0	5	5
6	2	4	4	5
9	2	4	9	8
10	2	4	6	4
12	1	2	7	6
19	1	3	3	4
23	1	1	2	3
24	1	2	1	0
29	2	<u>4</u>	<u>6</u>	<u>6</u>
Totals	-	28 (2.8)	50 (5.0)	48 (4.8)

Group 2

<u>Subject #</u>	<u>Ability Level</u>	<u>Pre-test (x)</u>	<u>Post Test #1 (x)</u>	<u>Post Test #2 (x)</u>
7	1	3	3	4
13	1	2	10	5
14	2	4	5	6
15	2	6	7	8
16	2	6	6	7
17	1	0	2	4
18	1	0	3	4
20	1	1	0	1
21	1	2	0	1
22	2	<u>4</u>	<u>8</u>	<u>8</u>
Totals	-	28 (2.8)	44 (4.4)	48 (4.8)

Group 3

<u>Subject #</u>	<u>Ability Level</u>	<u>Pre-test (x)</u>	<u>Post Test #1 (x)</u>	<u>Post Test #2 (x)</u>
3	1	2	3	7
4	2	4	5	5
5	1	2	6	6
8	1	3	4	3
11	1	2	4	4
25	1	0	1	1
26	1	1	4	5
27	2	5	4	3
28	2	4	3	6
30	2	<u>5</u>	<u>3</u>	<u>1</u>
Totals	-	28 (2.8)	37 (3.7)	41 (4.1)

APPENDIX J

ABILITY LEVEL SCORING

Ability Level	N	Pre-test (x)	Post Test #1 (x)	Post Test #2 (x)
Low	17	26 (1.53)	58 (3.41)	64 (3.76)
High	13	58 (4.46)	73 (5.62)	74 (5.69)

APPENDIX K

POST EXPERIMENT QUESTIONNAIRE DATA

<u>Mental Process Level</u>	<u>Point Value</u>
Poor	1
Below Average	2
Average	3
Above Average	4
Excellent	5

<u>Group 1 (II) Scores</u>	<u>Group 2 (SMMP) Scores</u>
3	4
4	4
4	4
4	5
3	4
5	5
3	5
5	4
4	4
5	3
Total = 40	Total = 42
Mean = 4.0	Mean = 4.2

REFERENCES

- Andre, J. C., & Means, J. R. (1986). Rate of imagery in mental practice: An experimental investigation. Journal of Sport Psychology, 8, 124-128.
- Bradley, F. B. (1975). A comparison of three instructional methods on the improvement of selected badminton skills. Unpublished doctoral dissertation, Middle Tennessee State University, Murfreesboro.
- Chyzowych, W. (1978). The official soccer book of the united states soccer federation. Chicago, IL: Rand McNally and Co.
- Clark, L. V. (1960). Effect of mental practice on the development of a certain motor skill. Research Quarterly, 31, 560-569.
- Corbin, C. B. (1972). Mental practice. In W. P. Morgan (Ed.) Ergogenic aids and muscular performance. New York: Academic Press.
- Dirocco, P. J. (1975). An investigation to study the effects of various motor development teaching methods upon the acquisition of motor skills of three year old children. Unpublished master's thesis, University of Oregon, Corvallis.
- Drowatzky, J. N. (1981). Motor learning: Principles and practices. Minneapolis, MN: Burgess Publishing Company.
- Egstrom, G. H. (1964). Effects of an emphasis on conceptualizing techniques during early learning of a gross motor skill. Research Quarterly, 35, 472-481.
- Epstein, M. L. (1980). The relationship of mental imagery and rehearsal to performance of a motor task. Journal of Sport Psychology, 2, 211-220.
- Faries, D. (1979). Teach them right while they are young. Soccer World, pp. 20-21.
- Feltz, D. L., & Landers, D. M. (1983). The effects of mental practice on motor skill learning and performance: A meta-analysis. Journal of Sport Psychology, 5, 25-57.

- Gould, D., Weinburg, R., & Jackson, A. (1980). Mental preparation strategies, cognitions and strength performance. Journal of Sport Psychology, 2, 329-339.
- Harris, D. V., & Robinson, W. J. (1986). The effects of skill level on EMG activity during internal and external imagery. Journal of Sport Psychology, 8, 105-111.
- Jacobson, E. (1938). Progressive relaxation. Chicago: University of Chicago Press.
- LaLance, R. C. Jr. (1974). A comparison of traditional instruction, mental practice, and combined physical-mental practice upon the learning of selected motor skills. Unpublished master's thesis, Middle Tennessee State University, Murfreesboro.
- Maring, J. R. (1990). Effects of mental practice on rate of skill acquisition. Physical Therapy, 70, 165-172.
- Noel, R. C. (1980). The effect of visuo-motor behavior rehearsal on tennis performance. Journal of Sport Psychology, 2, 221-226.
- Oxendine, J. B. (1969). Effect of mental and physical practice on the learning of three motor skills. Research Quarterly, 40, 755-763.
- Phipps, S. J., & Morehouse, C. A. (1969). Effects of mental practice on the acquisition of motor skills of varied difficulty. Research Quarterly, 40, 773-778.
- Powell, G. E. (1973). Negative and positive mental practice in motor skill acquisition. Perceptual and Motor Skills, 37, 312.
- Reams, D. N. (1976). A comparison of the effectiveness of two methods of teaching selected sports activities to third and sixth grade children. Unpublished master's thesis, Texas A & M University, College Station.
- Richardson, A. (1967a). Mental practice: A review and discussion (Part 1). Research Quarterly, 38, 95-107.
- Richardson, A. (1967b). Mental practice: A review and discussion (Part 2). Research Quarterly, 38, 263-273.
- Rizk, A. (1968). The relative effectiveness of a multimedia approach in learning soccer. Unpublished master's thesis, University of Kentucky, Lexington.

- Rote, K. Jr. (1978). Complete book of soccer. New York: Simon and Schuster.
- Ryan, E. D., & Simons, J. (1981). Cognitive demand, imagery, and frequency of mental rehearsal as factors influencing acquisition of motor skills. Journal of Sports Psychology, 3, 35-45.
- Schmidt, R. A. (1982). Motor control and learning. Chicago: Human Kinetics Publishers.
- Singer, R. N. (1968). Motor learning and human performance: An application to physical education skills. London: The Macmillan Company.
- Singer, R. N., & Witker, J. (1970). Mental rehearsal and point of introduction within the context of overt practice. Perceptual and Motor Skills, 31, 169-170.
- Start, K. B. (1962). The influence of subjectively assessed "games ability" on gain in motor performance after mental practice. The Journal of General Psychology, 67, 169-173.
- Weinburg, R. S. (1982). The relationship between mental preparation strategies and motor performance: A review and critique. Quest, 33(2), 195-213.
- Weinburg, R. S. (1984). Mental preparation strategies. In J. M. Silva & R. S. Weinburg (Eds.) Psychological Foundations of Sport (pp. 145-156). Champaign, IL: Human Kinetics.
- Weinburg, R. S., Gould, D., Jackson, A., & Barnes, P. (1980). Influence of cognitive strategies on tennis serves of players of high and low ability. Perceptual and Motor Skills, 50, 63-66.
- White, K. D., Ashton, R., & Lewis, L. (1979). Learning a complex skill: Effects of mental practice, physical practice and imagery ability. International Journal of Sports Psychology, 10, 71-78.
- Woolfolk, R. L., Murphy, S. M., Gottesfeld, D., & Aitken, D. (1985). Effects of mental rehearsal of task motor activity and mental depiction of task outcome on motor skill performance. Journal of Sport Psychology, 7, 191-197.
- Wrisberg, C. A., & Ragsdale, M. R. (1979). Cognitive demand and practice level: Factors in the mental rehearsal of motor skills. Journal of Human Movement Studies, 5, 201-208.