

A COMPARISON OF THE EFFECTS OF IMAGERY  
PLUS UPPER BODY PHYSICAL PRACTICE WITH THE  
EFFECTS OF TRADITIONAL PHYSICAL PRACTICE  
ON SUCCESS IN FREE THROW SHOOTING

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AN ABSTRACT OF THE THESIS OF

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Title: A Comparison of the Effects of Imagery Plus Upper  
Body Physical Practice with the Effects of Traditional  
Physical Practice on Success in Free Throw Shooting

Abstract approved:

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Purpose: The purpose of this study was to investigate the effects of four weeks of mental practice (imagery) plus physical practice of the upper body movements with the effects of four weeks of physical practice on success in free throw shooting.

Methods of Research: Forty-five high school freshman male students were divided at random into three groups; (1) control group, (2) a mental practice group and (3) a physical practice group. The control group shot 25 free throws on days 1, 10, and 20, with no physical or mental practice between those days. The physical practice group shot 25 free throws on each of the twenty days. The mental practice group had active physical practice on days 1, 10, and 20

but practiced mentally with physical practice of the upper body for 10 minutes all of the other days throughout the experimental period. Data collected for each group on day 1, 10, and 20 were analyzed by analysis of variance (ANOVA).

Conclusions: Twenty days of traditional physical practice did have a significant positive effect on success in free throw shooting. Twenty days of mental practice (imagery) plus physical practice of the upper body did not have a significant effect on success in free throw shooting. Physical practice was significantly better than the combination of MP and upper body PP in improving free throw shooting. The control group did not change significantly over the duration of the experimental period.

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## Chapter 1

### INTRODUCTION

This chapter is devoted to information pertaining to mental practice and the effect it has on improving performance of free-throw shooting. The statement of the problem, the null hypothesis, the assumptions, the purpose, and significance of the study are discussed. Also discussed in this chapter are the limitations of the study.

#### Theoretical Formulation

Several studies have shown that cognitive and motor skills are interrelated. Neurophysiological evidence shows that when an athlete mentally practices movement of some part of the body, an increase in electromyographic recording occurs in the location corresponding to the motor activity being mentally practiced (Singer, 1975). These movements, though not visible, contribute to improvement of the skill being practiced mentally.

In autobiographies and biographies, many great athletes have noted their use of some form of mental practice. Bill Russell, one of the all-time great basketball players, devoted a whole chapter in his book to mental practice and how it helped him become a great player (Russell, 1979). Golfer Jack Nicklaus, in his book, claims that hitting good



shots depends 10 percent on his swing, 40 percent on his setup and stance and 50 percent on his mental picture (Nicklaus, 1974).

Psychologists are working with athletes and coaches trying to develop new ways to improve athletic performance. In past years, the emphasis placed on physical preparation has by far overshadowed the area of psychological preparation. With the growth of sport psychology, coaches and athletes have begun to realize the importance of mental preparation (Jacobs, 1982). Mental practice is defined as "the symbolic rehearsal of physical activity in the absence of any gross muscular movement" (Richardson, 1967a p. 97). Mental practice has been the term most frequently used in literature on this topic. It has also been investigated under a variety of names such as imagery rehearsal, mental rehearsal, symbolic rehearsal, and conceptualizing practice. Review of the literature on mental practice indicates that there is not always clear distinction among the various terms. In this study, the term mental practice will be used to represent any and all of the above mental strategies.

A few studies (Stebbins, 1968) have used the combination type practice in hopes of obtaining an optimal effect. However, these students used each type of practice independently, that is, subjects used mental practice the first week and then switch to physical practice the next and vice versa. The mental practice in this study consisted of imagery which was combined with physical practice of the upper body. That is the subjects bodily rehearsed the upper

body movement while mentally practicing (i.e. imagining the factors associated with) free-throw shooting.

As studies continue to show that various techniques of mental practice have significant effects on the learning of and increased success in performance of motor skills, the implications for physical education and athletics increase tremendously. With mental practice, one could improve a motor skill without using the time required for physical practice. Effective mental practice could also reduce the need for expensive equipment and facilities. Finally, the present financial crisis leading to reductions in academic as well as athletic budgets, the possible savings in personnel, equipment and time through the use of mental practice makes this area of research extremely important.

### The Problem

Sports psychologists (Suinn, 1980, Singer, 1975) have found that mental practice enhances physical performance. Many athletes, some of whom are among the most successful in their respective sports, have revealed that mental preparation is a vital part of their success; yet coaches and athletes in general have remained ignorant about or reluctant to apply such techniques. Although much research has been conducted in this area, specific questions must be answered and techniques of application clearly defined before mental practice will be embraced by the coaches and physical educators. One such question is determining if

there is a significant difference between learning a motor skill by using mental practice as compared to learning only through traditional physical practice. This question has created a need for further research into the effects of mental practice.

### Statement of the Problem

Is there a significant difference in the level of success in shooting free throws between high school males using traditional physical practice, imagery while physically rehearsing the upper body action, and no practice (control)?

### Statement of the Hypothesis (Null Form)

There is no significant difference in the level of success in shooting free throws among high school males using traditional physical practice (PP), those using imagery while bodily rehearsing the upper body action (MP), and those without any practice (C). Stated symbolically, the null hypothesis was:  $H_0: \mu_{PP} = \mu_{MP} = \mu_C$

$$H_1: \mu_{PP} < \mu_{MP} = \mu_C$$

$$H_2: \mu_{PP} = \mu_{MR} < \mu_C$$

$$H_3: \mu_{PP} < \mu_{MR} < \mu_C$$

$$H_4: \mu_{PP} > \mu_{MR} = \mu_C$$

$$H_5: \mu_{PR} = \mu_{MR} > \mu_C$$

$$H_6: \mu_{PP} > \mu_{MR} > \mu_C$$

### Assumptions of the Study

It was assumed that the sample of subjects used in this study was representative of all male freshman high school

students who live in a small mid-western community. It was also assumed that the subjects tested put forth their best effort while performing in their specific practice groups and during each testing session.

### Purpose of the Study

The role and effect of mental practice has recently been acknowledged as having an influence on athletic performance. It was the purpose of this study to determine the effects of a combination of mental practice and upper body physical practice on the success level in shooting of free throws as compared to the effects of traditional physical practice alone.

### Significance of the Study

Educators are always looking for new and effective means of teaching and saving money. Studies continue to show that mental practice has a significant effect on motor performance. The implication such practice has for providing savings in time, facilities, equipment and personnel is tremendous for those in teaching situations where large classes, lack of equipment and inadequate facilities are problems.

### Limitations of the Study

The following were considered limitations of this study:

1. No systematic method was used to determine if students performed mental practice with maximum effort and concentration.

2. Groups were assigned at random, however, the possibility exists that these groups might have been very different from one another in regard to attitudes and abilities.

3. The optimal length of practice period for males of this age group has not been determined. Therefore, time of the mental practice sessions could have been too long or too short.

4. The presence of an outsider as administrator of the study could have influence on the students' willingness to cooperate, thereby affecting the results.

## Chapter 2

### REVIEW OF RELATED LITERATURE

Research into specific aspects of motor performance has led to greater insight into athletic performance. One area of research which has generated much interest among coaches and athletes is mental practice. This chapter will discuss research that relates specifically to techniques and effects of mental practice. It will also discuss cybernetics and psychology and how they relate to mental practice.

#### Mental and Physical Practice Research

One of the earliest ventures into how mental aspects influence sports performance was initiated by Philip K. Wrigley (Wrigley, 1976), President of the Chicago Cubs baseball team of the National League. The Cubs had a series of championship teams 1929, 1932, 1935, and 1938. In 1938, Wrigley decided to have psychological and physiological tests made on the team to determine what went into the making of a pennant-winning baseball team. Wrigley was hoping to develop a profile of a champion against which young prospects could be measured. Wrigley's idea was good; but the one flaw was the reaction of the ballplayers. They were made nervous by the presence of a psychologist,

and anyone seen talking to the psychologist was viewed by his peers as being a little flaky. Wrigley finally had to call off the project, for he was just too far ahead of his time.

Vandell, Davis, and Clugston (1943) conducted a study on the effects of mental practice in the learning of motor skills. The motor skills used in this study were free-throw shooting and dart throwing. Twelve junior high school males and twelve college freshman males were used in the dart throwing experiment, while twelve senior high school males were used in the free-throw experiment. Each class was made up of twelve subjects, who were then divided into three groups of four subjects each. The procedure followed by each group during the testing period was as follows:

1. Control group practiced only first and twentieth day.
2. Physical practice group practiced each day.
3. Mental practice group had actual physical practice on the first and twentieth day and mental practice from the second through the nineteenth day.

Under the conditions of the experiment, the authors found mental practice to be nearly as effective as physical practice for both motor skills.

Twining (1949) used thirty-six college male subjects selected at random from physical education classes to participate in a study of the effects of mental practice on learning ring tossing. The subjects were divided into three

groups of twelve. Group one threw 210 rings on the first day, 70 rings each day from the second through the 21st day and 210 rings on the 22nd day. Group three subjects threw 210 rings on the first day, then mentally rehearsed from the second through the 21st day, and threw 210 rings on the 22nd. Scores from the first and 22nd day were analyzed and compared. At the conclusion of the experiment, the author found that the subjects receiving no practice showed no significant improvement in ring tossing accuracy. The group receiving physical practice improved 137 percent and the group receiving mental practice improved 36 percent. Twining concluded that both physical practice and mental practice, under these experimental conditions, were effective in the learning of a simple motor skill.

Stebbins (1968) conducted a study to determine the relative effectiveness of mental and physical practice upon the learning of a ball throwing task. Ninety-three male volunteers enrolled in physical education courses at Georgia Southern College were used as subjects. Subjects were randomly assigned to the following five treatment conditions: control, mental practice, physical practice, mental-physical practice, physical-mental practice. Practice consisted of throwing balls at a target from a distance of fifteen feet. The target consisted of eighty-one square compartments designed so the balls would lodge in the compartments. The compartments were different colors arranged in a bull's-eye pattern and had score values from one to five. On the



testing day, subjects were given 100 trials. Point values of the 100 trials were totaled to give an individual score. The subjects in this study were divided into the five treatment groups and given eighteen practice sessions in their respective groups. The treatment groups were as follows: The control group did not have any practice sessions. The mental practice group was asked to try and visualize the first testing day and then mentally rehearse throwing 25 balls during each of the practice sessions. The physical practice group threw 25 balls at each practice session. The mental-physical practice group mentally practiced the first 8 days and then physically practiced the last 8 days. The physical-mental practice group followed the same procedure but in reverse order. The results of the study indicated that the combination-type treatment conditions (MP-PP and PP-MP) did significantly better than any of the other treatment groups in learning hand-eye coordination skills.

Along with mental practice research, a lot of interest has been generated in the area of psychology in sports. Suinn (1976), who was one of the first psychologists to work with American Olympic athletes, began his psychological training with athletes at Colorado State University. The ski coach asked Suinn to help his skiers manage their competition tensions. Suinn did this by using a method known as "visuo-motor behavior rehearsal" or VMBR. The method can be divided into three steps: relaxation, the practice

of imagery, and the use of imagery for strengthening psychological or motor skills. After practicing Dr. Suinn's VMBR program, several of the Colorado skiers performed personal bests in their respective events. Because of his success in improving the performance of these skiers, Dr. Suinn was asked to help with the 1976 Winter Olympic team. His appointment marked the first time that the United States provided on the site psychological services for its athletes. Suinn (1976) points out that use of psychological techniques for improving motor performance is not new to the Olympic athletes. Several European nations and Russia have recognized that the mind helps determine athletic success. East Germany, which in 1976 was basically a new entry into the Olympic arena, had rigorous psychological training as part of its Olympic training program. In the 1976 Winter Games, the East Germans carried away the second highest number of medals. The Czechoslovakians, who are modest when giving credit to psychology, nevertheless have a psychologist who travels with their sport teams. Dr. Suinn, as part of his psychological training program, instructed the skiers he helped train to practice their athletic skills by mental imagery. The technique had been used before by Jean-Claude Killy, a three-time gold medal skier. Killy reported that his only preparation for one race was to ski it mentally. It should be noted that Killy was already an expert in this sport. Because of an injury, he couldn't physically practice on the course. Therefore, his only alternative

was mental practice. Killy said that the race turned out to be one of his best, convincing him of the value of mental practice. Kellner (1978), in his book Taking It To The Limit, deals with cybernetics, an area closely related to mental practice. In simple terms, cybernetics means the science of automatic control. This is the area in science which is responsible for putting brains into electronic computers. Kellner believes that an athlete's mind is the world's greatest computer and that it is the control center for performance. Kellner says that hidden in the subconscious mind is a control mechanism that automatically supplies the power for all human behavior and performances, but in most people, it is unable to perform feats of success because it has been confined by an inadequate self-image. Kellner suggests that one can successfully reprogram the human computer by improving self-image, which in turn leads to better performance. Self-image refers to one's conception of himself.

The fundamental technique of cybernetics is the use of repetitive and disciplined mental picturing to change the way the athlete thinks of him/herself. This mental imagery can affect performance. When Kellner was varsity basketball coach at Sonderling High School in Brentwood (N.Y.), his teams, using his cybernetic techniques, won 9 consecutive championships. Over that period of time his teams accumulated a record of 166 wins and 30 losses. Prior to implementing this unique power of the mind training program,

his teams lost as many as they won.

The following quote from Maltz illustrates the power of the mind:

"Experimental and clinical psychologists have proved beyond a shadow of a doubt that the human nervous system cannot tell the difference between an "actual" experience and an experience imagined vividly and in detail." (Maltz, 1960, pxii)

An example of this concept would be a situation in which a hypnotized subject is told that the experimenter's finger is a red hot poker. When the experimenter touches the subject with his fingers the subject reacts with pain. The subject's cardiovascular and lymphatic systems will react just as if they had been burned with a hot poker and produce inflammation and sometimes even blisters on the skin (Maltz, 1960).

When reviewing mental practice research and areas closely related, one needs to consider the practice conditions. Psychologists and teachers have long acknowledged that task repetition influences task learning and performance. Too much as well as too little repetition can be detrimental. When the length of the practice becomes excessive, performance will decrease. Knowing the optimal length of a practice session and not continuing beyond that point would give best results. Preliminary work by Harby (1952) suggests that an optimal length for mental practice sessions exists. Richardson (1967) and Oxendine (1968) also support Harby's idea that an optimal length exists for mental practice sessions, but they have not indicated how long such

sessions should be.

A study by Schick (1969) showed that 1-minute sessions compared to 3-minute sessions were not as effective in promoting improved skill performance. Twining (1949) suggested that the optimal length of the mental practice sessions be 5-minutes.

The duration of the learning experience is also an important consideration. Corbin (1970's), in doing research on the studies of mental practice, has found that investigators have ignored the matter of duration of the learning experience. For many years, results from mental practice sessions ranging from one day to several weeks have been compared just as if the practice sessions were equal. Corbin pointed out that further research into the effects of the duration is needed.

It is often assumed that when a athlete is told to mentally practice a skill that he or she will know how. Darrish (1983) points out that having knowledge of how to mental practice is not enough. To have effective learning take place with mental practice, one must understand the components of mental practice process, and also have supervised practice sessions on mental practice techniques.

## Chapter 3

### METHODS AND PROCEDURES

#### Population and Sampling

Subjects for this study consisted of forty-five male students enrolled in physical education classes during 1983 in a high school located in mid-western United States. The subjects were all freshman and picked at random. Varsity basketball players were not allowed to participate in this study.

#### Procedures

Forty-five subjects participated in the study. The subjects were divided at random into three groups of fifteen each. Before testing, each group was given instructions on how to properly shoot a free throw. (Appendix D) Group 1, the control group, was tested on the first, tenth, and twentieth days of the experimental period. Group 1 had no physical practice or mental practice of any kind between those days. Group 2 had actual physical practice (25 shots) on each of the twenty days. Group 3, the experimental group had actual physical practice (25 shots) on the first, tenth, and twentieth days and practiced with imagery and physical practice of the upper body for 10 minutes all of the other days throughout the

experimental period. Instructions given to the mental practice group were as follows:

1. The student's eyes should be closed and the body relaxed.
2. The student should imagine himself standing at the foul line preparing to shoot a free throw with his focus on the rim.
3. The student should then imagine what it would feel like to hold a basketball in his hands (weight, texture, size, etc.).
4. When the student mentally shoots he should visualize the flight of the ball and see it going over the front of the rim.
5. Just before the ball is to drop through the rim, the student should open his eyes to see a photograph of a basketball going into the basket.
6. While visualizing the free throw shot the student physically practices the upper body movement.

It was emphasized that every mentally practiced free throw be a successful one. The amount of time for mental practice was ten minutes per day, which is comparable to the time it took the physical practice group to shoot 25 actual shots, 5 at a time, with three to four people at a basket. During testing on the first, tenth, and twentieth days, the mental practice group followed the same procedure as the physical practice group did in shooting their free throws. The experimental period consisted of twenty

consecutive school days. One day was added to the experimental period as a make-up day.

### Data Collection

Data were collected for all three groups on the first, tenth, and last day of the experimental period. Group 1's (PP) daily scores were recorded; however, only the data collected on days one, ten, and twenty were used for comparisons with the other two groups. Scores were determined by total baskets made out of 25 free throw attempts by each individual, in each of the three groups. Those scores were recorded for analysis.

In addition, the three recorded scores (first, tenth, and last day) were totaled to yield a grand total for each group. These grand totals, based on the number made in 75 free throw attempts (25 each on days 1, 10 and 20) for each group were analyzed also.

### Data Analysis

To analyze the obtained data, two statistical tools (t-test and ANOVA) were used. The analysis of variance (ANOVA) was done to determine if there was a significant difference between the means of the three groups for data collected on days one, ten, and twenty. A t-test was utilized to determine if there were any significant differences between the means of the first, tenth, and last day for each individual group.



## Chapter 4

### ANALYSIS OF DATA

This chapter contains the demographic information regarding the individuals in the three groups, along with the analysis of the obtained data.

#### Response Analysis

At the outset of this study, it was determined that a total of 45 students would be used (15 per group). However, due to excessive absences, two participants were eliminated from the study. One student was removed from the physical practice group, while another was removed from the mental practice group. All of the remaining 43 students were freshman high school boys.

#### Data Analysis

Data were first analyzed according to the days in which scores were recorded (first, tenth, and twentieth days). The analysis of variance (ANOVA) was used to determine if there was a significant difference between the three group means, while the Scheffe' test for specific comparisons was utilized to see which groups did, in fact, differ.

First Day

It was found that Group 1 (PP) had the highest mean ( $\bar{x} = 10$  baskets out of the 25 trials) on the first day. Group 2 (MP) had an average of 7 baskets out of the 25, while Group 3 (control) was lowest with a mean of 6.73. Group 3 had the most variability in their free throw attempts, with a standard deviation of 3.69. Group 2 had the smallest standard deviation ( $s = 3.16$ ). Using the analysis of variance (ANOVA) to test for a significant difference between the means, it was found that Group 1 did significantly better on the first day than Group 3,  $F(2,40) = 3.94, p < .05$ . For the specific comparison of these three means, the Scheffe' test revealed there was no significant difference between Group 1 and 2, nor between Group 2 and 3. Table 1 summarizes the results of this ANOVA.

Table 1

ANOVA Summary Table of Free Throw Accuracy Among  
3 Separate Practice Treatment Groups  
on the First Day

Source	df	Sum of Squares	Mean of Squares	F
Between groups	2	93.49	46.74	3.94*
Within groups	40	474.93	11.87	
Total	42	568.42		

\*Significant at the .05 level

Tenth Day

On the tenth day, second recorded testing period, data showed that Group 1 (PP) had the highest mean with 12.64 baskets out of 25 attempts. Group 2 (MP) had an average of 7.5 baskets out of 25 attempts, while Group 3, the control group, was the lowest with a mean of 5.33. Data obtained on the tenth day showed that Group 1 was the most varied in their free throw scores, having a standard deviation of 3.65 and Group 3 the least varied with a standard deviation of 2.09. Using the analysis of variance (ANOVA) to test for a significant difference between the means, it was found that on day 10, Group 1 did significantly better than both Groups 2 and 3,  $F(2,40) = 21.9$   $p < .01$ . The Scheffe' test indicated there was no significant difference between Group 2 and 3. Table 2 summarizes the results of this ANOVA.

Table 2

ANOVA Summary Table of Free Throw Accuracy Among  
3 Separate Practice Treatment Groups  
on the Tenth Day

Source	df	Sum of Squares	Mean of Squares	F
Between groups	2	404.41	202.20	21.85*
Within groups	40	370.04	9.25	
Total	42	774.5		

\*Significant at the .01 level

Twentieth Day

On the last day of the testing period, data showed that Group 1 (PP) again had the highest mean with 15.71 baskets out of the 25 shots. Group 2 (MP) had as it's mean 6.79 baskets out of 25 shots, while Group 3, the control group, was lowest with a mean of 5.93. Data collected on the twentieth day further showed that Group 1 was the most varied in their free throw scores with a standard deviation of 3.07 while Group 3 was the least varied with a standard deviation of 2.40. Using the analysis of variance (ANOVA) to test for significance between the means, it was found that Group 1 did significantly better on the twentieth day than either Group 2 or 3,  $F(2,40) = 54.49$ ,  $p < .01$ . Again, the Scheffe' test revealed no significant difference between Group 2 and Group 3.

Table 3

ANOVA Summary Table of Free Throw Accuracy Among  
3 Separate Practice Treatment Groups  
on the Twentieth Day

Source	df	Sum of Squares	Mean of Squares	F
Between groups	2	834.13	417.06	54.49*
Within groups	40	306.14	7.65	
Total	42	1140.27		

\*Significant at the .01 level

t-test Analysis of Data

Because of the smaller sample size for each separate group, it was determined that the t-test for dependent samples would be appropriate for comparing the means of each group on the first, tenth and twentieth day. The t-test would determine if there was a significant difference between the means. The t-test was computed for each separate group. The results of the t-test disclosed that there was no significant difference in pre-test scores (first day) and mid-scores (tenth day) for all three groups. When the pre-test means were compared to the twentieth day means, there was a significant difference found for Group 1 (PP),  $t(13) = 5.36$   $p < .01$ . The mean on the twentieth day was 15.71 (SD = 3.07) while on the first day the obtained mean was 10.00 (SD = 3.44). Group 1 revealed a significant improvement in their free throws after twenty days of physical practice. Table 4 summarizes the results.

Table 4

t-test Summary Table of Free Throw Accuracy  
Between the First and Twentieth Days

Source	df	Mean	Standard Deviation	<u>t</u>
First day	13	10.00	3.44	5.36*
Twentieth day		15.71	3.07	

\*Significant at .01 level

No significant differences were found between the first and twentieth day means for Group 2 or Group 3.

## Chapter 5

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### Summary

It was the purpose of this study to determine the effects of mental practice along with physical practice of the upper body movement on the success level in shooting of free throws as compared to the effects of traditional physical practice alone.

#### Conclusions

Within the limits of the study, the following general conclusions can be made:

1. Twenty days of traditional physical practice did have a significant positive effect on success in free throw shooting.

2. Twenty days of mental practice (imagery) plus physical practice of the upper body did not have a significant effect on success in free throw shooting.

3. Physical practice was significantly better than the combination of MP and upper body PP in improving free throw shooting level.

4. The control group did not change significantly over the duration of the experimental period.

Conclusions #1 and #3 above were consistent with

findings of previous investigations which also found PP to increase motor skill and to increase it more than did MP. However, the second conclusion, from the present study was not expected in view of previous research which found MP to be effective in improving motor skills.

The effectiveness of MP has been shown to be influenced by a number of variables, such as ability level, type of task, conceptualizing ability, duration of the practice sessions and training in the MP technique. Lack of control over some of these variables might have influenced the subjects of this study in such a way that the results differed from what was to be expected. After reviewing the scores of each of the groups, it would appear that the PP group had a higher ability level than the other two groups due to error of randomness when groups were assigned. Also, the mental practice sessions of 10 minutes might have been too long for the subjects in this study as evidenced by other studies which suggested 5-minutes to be the optimal length. Another possible reason for failure to support previous findings was the fact that subjects in this study had no personal goals or rewards for participating in the study; therefore, there was little motivation to encourage students to put forth their maximum effort and concentration while in the mental practice sessions.

#### Recommendations

It is recommended that several training sessions be conducted on mental practice technique prior to start of



the study, so that the subjects in the mental practice sessions fully understand the mental practice process. It is also recommended that the length of mental practice sessions be reduced to 5 minutes.

Finally, the investigation was concerned that being an outsider to the school system made it difficult to establish the motivation level needed to properly execute mental practice sessions.

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APPENDIX A  
Letter to Parents

Dear Parents,

This letter is to inform you of a study being done with freshman and sophomore students at Emporia High School.

My name is Wayne Smith, and I am a graduate assistant in the Health, Physical Education, Recreation and Athletics Department at Emporia State University. I am conducting this study as a research project for my Master's degree thesis.

The purpose of this study is to determine the effects of mental practice on the learning of a motor skill. The skill in this study will be freethrow shooting. There will be three groups, a physical practice group, a mental practice group and a control group. All data collected will be recorded on coded forms so that all results will be confidential.

It is essential that the students be at school during the twenty days of testing. In case of sickness or absences arrangements will be made to shoot freethrows on a weekend. For the validity of this study it is important that once a student begins the study he remain in it until it is completed. However, each student has the right to withdraw or be withdrawn by parental request without any repercussions. There are not inherent dangers in taking part in this study. For the validity of this study the students should not play basketball during the study period.

If you have any questions about the study or would like more information, please call me at 343-1200, Ext. 354. Thank you for your time and cooperation.

Sincerely,

Wayne Smith

APPENDIX B  
Parent Consent Forms

1

## Parent Consent Form

I, \_\_\_\_\_, the parent/guardian  
 (parent/guardian)  
 of \_\_\_\_\_, hereby give my permission for  
 (participant)  
 my son to participate in the mental practice study being  
 conducted by Wayne Smith at Emporia Senior High School.

I understand that it is important that my child  
 finishes the study once he starts, but I retain the right  
 to withdraw my child from the study if compelled to do  
 so. I understand that the results of the study will be  
 completely confidential.

\_\_\_\_\_  
 Date

\_\_\_\_\_  
 Parent/Guardian Signature

\_\_\_\_\_  
 Address

\_\_\_\_\_  
 Phone



APPENDIX C  
Coded Recording Sheet

CODED RECORDING SHEET

## Control Group

001

002

003

004

005

006

007

008

009

010

011

012

013

014

015

## Physical Practice Group

016

017

018

019

020

021

022

023

024

025

026

027

028

029

030

CODED RECORDING SHEET

## Mental Practice Group

031  
032  
033  
034  
035  
036  
037  
038  
039  
040  
041  
042  
043  
044  
045

APPENDIX D  
Instructions

Instructions on how to properly shoot free throws.

1. Shoulders square to basket.
2. Feet shoulder width apart.
3. Ball on finger pads not flat on the palm.
4. Elbow in.
5. Knee's slightly bent.
6. Shoot and follow through on the shot.