UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE USE OF IMAGERY, MENTAL PRACTICE, AND RELAXATION TECHNIQUES FOR MUSICAL PERFORMANCE ENHANCEMENT

A DOCUMENT

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

DOCTOR OF MUSICAL ARTS

By

LESLEY ANN SISTERHEN

Norman, Oklahoma

2005

Downloaded from SHAREOK. Persistent Handle URL: https://hdl.handle.net/11244/892

UMI Number: 3174357

Copyright 2005 by
Sisterhen, Lesley Ann

All rights reserved.



UMI Microform 3174357
Copyright 2005 by ProQuest Information and Learning Company.
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

THE USE OF IMAGERY, MENTAL PRACTICE,

AND RELAXATION TECHNIQUES

FOR MUSICAL PERFORMANCE ENHANCEMENT

A Document APPROVED FOR THE

SCHOOL OF MUSIC

BY

Dr. Jane Magrath, Chair

Dr. Barbara Fast

Dr. Joseph Havlicek

Dr. Sanna Pederson

Dr. Edward Gates

©Copyright by LESLEY SISTERHEN 2005
All Rights Reserved

ACKNOWLEDGEMENTS

I wish to acknowledge the support and assistance of many individuals whose contributions made possible the completion of this document. My deepest appreciation is extended to the members of my committee for the generous gift of their time and effort. My sincere thanks goes out to Dr. Jane Magrath, who has served in several roles as the chair of my committee, my academic advisor, and my mentor throughout the process of completing the document. Her invaluable advice, dedication, wisdom, and editing savvy have served as both an inspiration and a model of musical and academic integrity against which I have been able to measure my own work.

The support and guidance of other members of my committee have also been invaluable. I wish to thank Dr. Barbara Fast, whose insightful reading of my document and enriching pedagogical guidance have challenged me to grow as a teacher and writer. Dr. Sanna Pederson deserves thanks for her support of the study along with her specific ideas regarding style and content which were very beneficial in the writing process. Thank you to Dr. Joseph Havlicek for his interest in the study and his unique perspective as both a musician and a member of the faculty of the College of Engineering. My appreciation also goes out to Dr. Stephenson, whose knowledge of grammar and formatting and his keen editor's eye increased the professionalism and scholarship of the document. I would also like to thank Dr. Gates, who was willing to become a member of the committee

during my final semester and showed interest, encouragement, and an impressive amount of prior knowledge in the subject matter.

Special thanks is given to the five pianists, hereafter known as Harrison, Margaret, Matt, Annie, and Stephen, who dedicated their time, energy, and loyalty as participants in the study. Their commitment to being actively involved in the study by completing the individual assignments, being present at every session, and fully engaging in the imagery and relaxation routines made the study possible.

Thank you to Chad, Molly, and my sister Laura for being my support system and always offering encouragement when it was needed. Finally, I would like to thank my parents, Pat and George, who have always had faith in me throughout my years of being a student of the piano.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS iv

TABLE OF CONTENTS vi

LIST OF TABLES x

ABSTRACT xii

CHAPTER

I. Introduction 1

Background 1
Need for the Study 4
Purpose of the Study 5
Description of the Study 8
Research Design 13
Instrument Description 24
Personal Report of Confidence as a Performer (PRCP) 25
State/Trait Anxiety Inventory (STAI) 25
Definitions of Terms 27
Limitations of the Study 30
Organization of the Study 32

II. Review of the Literature 34

Relaxation Techniques 34
Progressive Muscular Relaxation (PMR) 40
Visuo-Motor Behavior Rehearsal (VMBR) 42
Deep Breathing 48
Relaxation Training and Systematic Desensitization 50

Imagery Research in Sport Psychology 56
Historical Overview of Imagery Research 60
Self-Reports by Athletes 63
Imagery Ability 64
The Importance of Positive Imagery 69
Research Supporting the Psychoneuromuscular Theory 70
Research Supporting the Symbolic Learning Theory 73
Research Supporting the Bio-informational Theory 75
Self-Efficacy Theory 78

Research Supporting the Attention-Arousal Set Theory ...79

Imagery Research in Music 80
The Use of Imagery by Musical Pedagogues 86
The Use of Imagery to Alleviate Performance Anxiety 89
Imagery Use by Elite Musicians 90

Practical Applications of Imagery 92
Regulation of Arousal 92
Memory 95
Concentration 97
Aural Awareness and "Audiation" 102
Education 107
Problem Solving 108
Medicine 110
Muscular Efficiency 113

Mental Practice Research in Sport Psychology 115
Meta-Analyses of the Literature 117
Slow-Motion Mental Practice 121
Mental Practice and Intelligence 123
Mental Practice and Simulated Movement 124
Mental Practice and Task Difficulty 125
Mental Practice and Motivation 126
The Combination of Mental and Physical Practice 127

Mental Practice Research in Music 129
Mental Practice and Memorization of Music 130
Mental Practice with Listening 132
Mental Practice and Simulated Movement 133
Mental Practice and Aural Knowledge of Results 134
The Combination of Mental and Physical Practice 135

III. Results 138

Analysis of Pre- and Post-test Scores: STAI and PRCP 142
State/Trait Anxiety Inventory (STAI) 144
Personal Report of Confidence as a Performer (PRCP) ..148

Perception of Performance Change from Self-Report: Videotape Evaluations 149
Session One 152
Session Two 159
Session Three 164
Session Four 169
Session Five 173

Comparison of Scores among Different Sessions.....177

Progressive Relaxation and Imagery: Subject Perceptions of Efficacy.....185
Progressive Relaxation.....189
Imagery: Clarity and Controllability.....196
Imagery in Group Sessions.....197
Imagery in Individual Practice.....207

Mental Practice.....211
Week One.....211
Week Two.....215
Week Three.....219
Week Four.....221
Summary of Mental Practice.....224

Subject Perceptions of Efficacy.....228
Mental Practice Logs.....229
Final Evaluation.....230
Final Interview.....237

IV. Summary, Conclusions, and Recommendations.....249

Summary.....251
Self-confidence.....251
Regulation of Arousal.....254
Overall Performance.....256
Concentration.....258
Memory.....260
Videotape Evaluations.....262
Relaxation Techniques.....264
Imagery.....266
Mental Practice.....267

Conclusions.....270
Recommendations for Further Study.....272

Bibliography.....277

Appendices.....301

Appendix A: Outline of Research Procedure.....301
Appendix B: Informed Consent Form.....306
Appendix C: Personal Report of Confidence as a Performer.....308
Appendix D: State/Trait Anxiety Inventory (STAI).....310
Appendix E: List of Final Goals for Performance.....314

Appendix F: Self-Evaluation of Videotaped Performance 315
Appendix G: Deep Breathing Script for Group Session One 316
Appendix H: Progressive Relaxation Group Session Scripts 319
Appendix I: Imagery Group Session Scripts 336
Appendix J: Imagery Exercise Worksheets 345
Appendix K: Practice Logs 350
Appendix L: Relaxation Exercises for Individual Practice.....364
Appendix M: Imagery Exercises for Individual Practice 369
Appendix N: Final Evaluation 375

LIST OF TABLES

Table 1: Comparison of Pre-Test and Post-Test Scores on the STAI and PRCP by Subject 144

Table 2: Videotape Evaluation Ratings from Session One.....154

Table 3: Videotape Evaluation Ratings from Session Two.....160

Table 4: Videotape Evaluation Ratings from Session Three.....165

Table 5: Videotape Evaluation Ratings from Session Four.....171

Table 6: Videotape Evaluation Ratings from Session Five 174

Table 7: Ratings in Each Category from Session One to Session Five 177

Table 7.1: Accuracy.....177

Table 7.2: Concentration.....177

Table 7.3: Memory.....178

Table 7.4: Confidence.....178

Table 7.5: Musicality 178

Table 7.6: Overall Performance.....178

Table 7.7: Means.....179

Table 8: Mean Scores in each Category and Comparison among Sessions 183

Table 9: Imagery Exercise Worksheet Numerical Ratings.....186

Table 9.1: Session I.....186

Table 9.2: Session II 186

Table 9.3: Session III 187

Table 9.4: Session IV 187

Table 9.5: Session V 187

Table 10: Relaxation Ratings by Participant per Session 189

Table 11: Relaxation Ratings from Practice Logs 194

Table 12: Imagery Clarity Ratings by Participant per Session 200

Table 13: Imagery Controllability Ratings by Participant per Session.....201

Table 14: Imagery Clarity Ratings from Practice Logs 208

Table 15: Mental Practice during Week One.....212

Table 16: Mental Practice during Week Two 216

Table 17: Mental Practice during Week Three 220

Table 18: Mental Practice during Week Four.....222

Table 19: Subject Ratings of Efficacy 229

ABSTRACT

THE USE OF IMAGERY, MENTAL PRACTICE,

AND RELAXATION TECHNIQUES

FOR MUSICAL PERFORMANCE ENHANCEMENT

By: Lesley Ann Sisterhen

Major Professor: Jane Magrath, D.M.

This document presents information on how imagery, mental practice, and relaxation techniques may be used by musicians and music teachers to enhance performance. In the present study, imagery was defined as a mental process in which an individual consciously imagines an ideal performance in his or her mind. Its effects on performance have been studied extensively in the field of sport psychology. This type of imagery is usually preceded by relaxation techniques which help the musician to associate the simulated performance with a state of calmness and control. Mental practice, a specialized form of imagery, involves more detailed rehearsal and is usually used in the beginning stages of motor learning. The author investigated the impact of these techniques on the areas of self-efficacy or confidence, regulation of anxiety, concentration, and memory in an exploratory study with five graduate pianists.

The first part of the document contains a comprehensive review of the literature in both sport psychology and music on the use of mental practice, imagery, and relaxation techniques. The second part of the document reveals the results of an exploratory study involving five graduate pianists from the University of Oklahoma who engaged in mental practice, imagery, and relaxation techniques for four weeks. The study did not employ a control group but aimed instead at an in-depth analysis of how the techniques influenced five musicians' self-perception of performance ability.

The researcher met with the participants during five evenly spaced sessions over a four-week period. During these sessions, the subjects were trained in the use of progressive relaxation and imagery. The guided imagery techniques used in the study were modeled after Visuo-Motor Behavior Rehearsal (VMBR), a technique originally developed by the sport psychologist Richard Suinn.

After experiencing a relaxation and imagery exercise during each group session, the subjects performed one memorized piece for the group in a videotaped performance. The participants were asked to watch the videotape and evaluate the performance by rating the areas of accuracy, concentration, memory, confidence, and overall performance. In addition, the participants were asked to individually spend 15 to 20 minutes three times a week on specific mental practice, imagery, and progressive relaxation assignments.

Most of the evidence presented in the study came from the performers themselves, through self-evaluations of their own playing. The use of self-evaluations was necessitated by the fact that is difficult for an observer to judge performances in an objective way or to quantify a performer's level of concentration,

confidence, or anxiety. Investigation of the ratings on performance evaluations indicated that there was a trend toward higher ratings on each subsequent performance. The final performance was given the highest mean ratings in the areas of self-efficacy, regulation of anxiety, concentration, memory, and overall performance. The greatest improvement was in the area of overall performance.

In addition to performance evaluations, the study examined whether the combined techniques had any effect on the participants' ability to regulate their level of anxiety. The subjects were given the State/Trait Anxiety Inventory (STAI) and the Personal Report of Confidence as a Performer (PRCP) prior to their first performance as a pre-test and prior to their final performance as a post-test. Lower scores on all three tests indicate a reduction in anxiety. All five participants obtained lower scores on the post-test on the State portion of the STAI, with one participant decreasing her score by 27 points out of a maximum of eighty points. Four out of five participants obtained lower scores on the post-test of the PRCP.

The study also included subject comments from practice logs and imagery worksheets on which they described and rated their imagery and relaxation exercises. Comments from the participants indicated that it was difficult for them to concentrate for longer than five minutes during pure mental practice. The participants' self-report scores for imagery clarity and controllability were higher at every session, indicating that their imaging ability increased with training. The videotape evaluations were useful in helping participants notice physical tension, create the right sound, and have a more objective and positive image of their performances. The relaxation techniques helped the performers to recognize and eliminate physical tension, especially when

used prior to physical practice. At the end of the study, the participants filled out a final evaluation and took part in a final interview to assess their general perspective on the techniques used in the study. According to the participants, one of the most effective aspects of the study was its collaborative nature which created a bonding experience among the participants and helped them to feel supported by their peers during performance. All five participants felt that the techniques were effective in enhancing their overall performance, and they especially felt that it increased their self-confidence.

CHAPTER I

INTRODUCTION

Background

Musicians are often at a loss when they find themselves facing certain problems in their musical development. Whether struggling with physical tension, performance anxiety, memory slips, or other problems, many pianists feel that they have no place to turn except to go back to the practice room. "Performance enhancement" is a common term used by athletes and sport psychologists which refers to the use of cognitive strategies such as imagery and mental practice to improve performance. It may be advantageous for musicians to begin paying attention to the "performance enhancement" strategies used by athletes, which make use of cognitive strategies in addition to physical training.

For pianists, overuse or repetitive strain injuries form the most commonly diagnosed type of injuries. Practicing for too long at an instrument without breaks and excessive tension in one's playing are common risk factors that all too often lead to injury. Therefore, the possibility that mental practice can have the same benefits as

physical practice is worth investigating. Mental practice does not require an instrument, and it does not cause any physical exertion which can result in injury. Many pianists already incorporate mental practice into their regular routine, but research supporting its benefits in the field of music is sparse. In the field of sport psychology, however, there is a vast amount of research on both imagery and mental practice which musicians can transfer to their own field.

Imagery is a mental process in which an individual consciously imagines an experience in his or her mind. This technique "programs" the human mind to respond according to how it has been trained. Athletes such as Jack Nicklaus, Michael Jordan, and Nancy Kerrigan used this technique when they prepared for performance by "seeing" and "feeling" themselves perform actions successfully in their "mind's eye" (Moran 1991).

The act of imaging can include detailed mental rehearsal, or a broader vision that incorporates how it feels to be "in the spotlight" in either a competitive or performance situation. Everyone uses imagery on a daily basis, although some may use it more than others. When musicians imagine what it will feel like to go onstage, it is often with a sense of anxiety or apprehension. But imagery can also be used to help musicians approach their performance with more ease and confidence if it is approached in a systematic way that emphasizes a positive outlook and a successful result.

Sport psychologists work to help enable athletes to maximize their performance potential. They believe that peak performance is a consequence of both physical and mental factors, and specialize in the use of mental skills, such as imagery, relaxation, modeling, and mental practice. Many athletes and coaches say that at least 40 to 90

percent of sports success is due to mental factors (Williams 1986). Timothy Gallwey (1974) also equates athletic improvement with the development of mental skills, "without which high performance is impossible" (p. 17).

If athletes can improve their physical performance through the use of purely mental rehearsal, it is possible that musicians can gain the same advantages. It is relatively easy to find similarities between the fields of sports and music. First of all, both athletes and musicians depend on the trained response of their muscles to function in their skill. Secondly, performance in both skills requires concentration, focus, and the ability to allow the mind to control physical reactions when the body is under stress.

Richardson (1969) gave what has become the most influential definition of mental imagery. He stated that

> it refers to "all those quasi-sensory or quasi-perceptual experiences of which we are self-consciously aware, and which exist for us in the absence of those stimulus conditions that are known to produce their genuine sensory or perceptual counterparts, and which may be expected to have different consequences from their sensory or perceptual counterparts (p. 2-3).

Athletes and sport psychologists have utilized imagery to influence performance in two primary ways. The first is as mental practice, which has been used to acquire, sharpen, rehearse, or transfer motor skills. Although the term "mental practice" is often used interchangeably with imagery, the two activities are not the same; mental practice is a specific type of imagery. One type of mental practice that qualifies as imagery is the imagination of motor movements. It can also involve thinking about an activity, such as analyzing a piece or listening to a recording. Mental practice is usually used to strengthen the learning of a new skill, and is often recommended at the beginning stages of learning a skill. For musicians, mental practice can be used at all stages, but is especially helpful when learning or memorizing a piece.

The second way in which athletes use imagery is as a preparation or coping strategy to help manage their performance. This use of imagery often occurs in close proximity to a performance, and usually involves imagining a successful performance (Budney, Murphy, and Woolfolk 1994).

Research in the field of sport psychology supports the idea that the use of imagery can help decrease anxiety during performance, increase focus and concentration, ease the effects of stress, and promote a more cognitive approach to practice. Imagery may also help an athlete connect a positive attitude or frame of mind with performance. If these same benefits can be gained for musicians, then it would be to their great advantage to become aware of the techniques and learn how to use them.

Need for the Study

At present, many musicians are unaware of the possible benefits that can be obtained from using imagery, mental practice, and relaxation techniques. The only research on mental practice that has been undertaken in the field of music has been related to its effect on sight-reading. Imagery has been studied by musicians only in an attempt to understand its effect on the elimination of performance anxiety. Researchers in music have not yet examined the performance enhancement effects of using mental practice and imagery in combination with relaxation techniques.

A vast amount of literature on mental practice, imagery, and relaxation is available in sport psychology research. Sport psychologists have found statistical

evidence that these techniques can be used for skill acquisition, skill maintenance, the planning of performance, the regulation of anxiety, stress management, increased concentration, and enhanced self-efficacy. If these same results could be attained by musicians, then they and others should be made aware of the possibilities inherent in using these techniques.

Music is not a sport, but an art form. While the present study reviews a great deal of literature in the field of sport psychology, it may not be assumed that all of the support for mental practice, relaxation techniques, and imagery in that field can be transferred into the field of music. Instead, the present study aims to find out whether these techniques can offer some of the same advantages to practicing musicians.

Purpose of the Study

The present study is exploratory and aims to elicit information about the impact of imagery and relaxation techniques on self-efficacy, regulation of anxiety, concentration, and memory during performance. Because it is impossible to judge performances in a completely objective way, there will be no quantifiable evidence of performance improvement presented. Most of the evidence presented in the study comes from the performers themselves, through self-evaluations of their own playing. In this way, the study examines whether the combination of imagery and relaxation techniques has any impact on a musician's own conception of performance success.

The purpose of the study is to present information on how imagery and relaxation techniques can be used by musicians and music teachers to enhance performance. Self-evaluations by musicians who have undergone a four-weeksession of imagery and relaxation work will reveal whether these techniques influence the subjects' views on performance success. These evaluations will also demonstrate what techniques were viewed as being most effective. In regard to the factors of self-efficacy, anxiety management, concentration, and memory, the subjects will be able to state in their evaluations as to whether imagery and relaxation impacted some areas more than others.

Whether the performer's skill level has increased or decreased cannot statistically be tested because of the subjective nature of musicianship. Instead, the study will show whether a musician begins to rank his performance level higher or lower as he begins to practice relaxation techniques with imagery rehearsal. In so doing, the study also takes into account that a musician's level of confidence in his ability may also be affected by regularly watching videotaped performances as well as by the continued use of relaxation techniques and imagery practice. The levels of confidence, concentration, and consistency in memory will also be evaluated by the performers themselves after they give each performance.

It is important to realize that all of these areas are interrelated. Memory improves with better concentration; anxiety lessens when one's confidence level is raised; and so on. If imagery benefits one area, it is likely that other areas will be influenced as well. Memory is a specialized and complex problem that will not be specifically addressed in the present study. It will mainly be seen as one element that

may be enhanced along with and perhaps as a consequence of an increase in overall performance ability.

This research study proposes to answer the following five research questions:

1. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect a musician's level of confidence in his or her ability?

2. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect a musician's level of concentration during performance?

3. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect how solid a musician's memory of the piece is during performance?

4. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect a musician's level of anxiety during performance?

5. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect a musician's evaluation of the overall success of a performance?

Description of the Study

It was initially proposed that six to ten graduate piano majors from the University of Oklahoma School of Music would be the subjects for the study. Although six participants entered the study initially, one participant dropped out during the first week so that the study contained five participants. During the course of the four-week study, they were required to spend 15 to 20 minutes three times a week on either mental practice or imagery or a combination of the two techniques. In addition to that amount of time, subjects individually performed specific progressive relaxation exercises prior to physical practice three times during each week.

The researcher met with the subjects during five sessions occurring once a week. During these sessions, the subjects were trained in the use of progressive relaxation and imagery. They performed for each other during each session. The piece performed during each session was chosen by the subjects before the study began. It was a memorized piece with a duration of five to seven minutes. During the first session, subjects filled out an Informed Consent Form in which confidentiality was assured (see appendix B).

During the study, subjects were given specific assignments that were related to mental practice, imagery, or both on which they spent 15 to 20 minutes of work, three times per week. All subjects were given practice logs which explained the practice assignments and allowed space for subject feedback in a questionnaire format (see appendix K). The questions were designed to assess the

subjects' perception of the impact of these techniques on their physical practice, understanding of the piece, and ability to play the piece. In addition to yes or no questions which are subject to quantitative analysis, subjects also had the opportunity to make individual comments.

During the first week of the study, the subjects were assigned progressive relaxation exercises and specific directions for using mental practice. The reasoning for using mental practice during the early part of the study was that mental practice has been shown to be more beneficial in the earlier stages of skill acquisition, and is more effective in learning or memorizing pieces than in enhancing the performance of an already polished piece. In addition, it was seen as likely that the subjects would need more training to become proficient in imagery than they would need for mental practice. Many research studies have required subjects to use mental practice with little subject training beyond simple instructions. However, most researchers on imagery have trained subjects for four to six weeks on imagery in order to assess changes in performance over the course of the study. More information about previous research studies on mental practice and imagery may be found in chapter II on "Related Literature."

Subjects were trained in the use of guided imagery during all sessions, as outlined in appendix I, using the visuo-motor behavior rehearsal (VMBR) introductory technique devised by Richard Suinn (1994). Visuo-motor behavior rehearsal (VMBR) is discussed in chapter II on "Related Literature," in the section on relaxation techniques. This type of imagery rehearsal combines relaxation with imagery.

The participants began using imagery on their own during individual practice by following the imagery instructions in appendix M during the last three weeks of the study. The individual practice of both mental practice and imagery rehearsal were always preceded by relaxation techniques. The guided imagery component contained the two steps that are part of imagery in visuo-motor behavior rehearsal (VMBR): imagining a successful performance (end result), followed by detailed mental practice of particular sections of the piece.

The benefit of this type of graduated research design is that it shows subject evaluations at each part of the process. Subjects were enabled to develop skill in deep breathing and progressive relaxation prior to using them on their own as a preface to imagery. Subjects also engaged in mental practice prior to using imagery. These musicians did not need guidance on how to use mental practice beyond instructions, and it helped them to develop their skills in imaging.

At the beginning of the study, the subjects were required to make a list of three goals that they hoped to attain in performance. A list of sample goals was given to them so that they could check off answers or add their own to the list (see appendix E). At the final session, the subjects assessed whether they had met those goals over the course of the study (see appendix N). This technique is a kind of goal setting which is proposed by sport psychologists as a way to help athletes maximize their performance potential. By asserting their goals before beginning the study, the subjects designated particular areas on which they wanted to focus. It was theorized that the mental practice assignments and imagery routines would be more beneficial if they were oriented toward specific, individualized goals.

Subjects performed one memorized piece, chosen by the subject prior to the study, during each of the group sessions. Performances were later evaluated by the subjects by individually watching a videotape of their own playing after each performance (see appendix F).

Having subjects watch videotapes of their own playing was viewed as a form of mental practice. Watching the videotapes, it was predicted, would reinforce the imagery of muscle movements, and would enhance an aural understanding of how the piece is heard by an audience. Watching videotaped performances allowed subjects to watch their own specific gestures and movement patterns while listening for areas that needed additional work. It was expected that this activity would reinforce the connection between an aural knowledge of the piece and physical movement. This form of mental imaging, it was predicted, would help to secure memory and reveal technical issues or places where muscular tension sets in. The watching of videotapes was seen as a type of external imagery in which the participant became familiar with how they were heard and viewed by the audience.

This technique is similar to, but not the same as, what sport psychologists refer to as "modeling." By watching videotapes of elite athletes or teams, it is predicted that athletes will internalize the kinds of movements used in order to assist their own performances. In this type of "vicarious learning," movement patterns are reinforced by watching videotapes of these movements being performed in an ideal way.

Performances in front of a group served two purposes in the study. First and of primary importance, they allowed the subjects a chance to assess whether their ability to perform in front of an audience had changed as a result of the treatment procedures. In addition, they offered an *in vivo* desensitization construct where subjects became used to performing in front of people by gradually being introduced to situations that provoked more anxiety. The use of *in vivo* desensitization will be discussed further in chapter II, "Related Literature," in the section on relaxation techniques.

The first performance took place in front of the entire group, so that appropriate comparisons could be made between the pre-test and post-test on anxiety level prior to performance. The second performance in Session II took place in front of the researcher only; in Session III, it took place in front of half of the group (2-3 subjects); and in Session IV, it took place in front of all subjects. The final performance in Session V took place in a recital open to the public where attendance by all piano majors and piano faculty was expected. This departmental piano recital takes place once a month at the University of Oklahoma as an opportunity for piano majors to gain performance experience.

Statistical differences in self-efficacy and anxiety regulation were assessed using the Personal Report of Confidence as a Performer, found in appendix C (Appel 1974) and the State Trait Anxiety Test (STAI), found in appendix D (Speilberger, Gorsuch, and Lushene 1970). Subjects took both tests at Session I, as a pre-test, and at Session V, as a post-test. Differences between pre-test and post-test scores were evaluated to assess whether the use of imagery and

relaxation techniques had any effect on confidence level or self-report of anxiety. The Wilcoxon Matched Pairs Signed Ranks test was used to determine significant changes between pre-test and post-test scores. The Personal Report of Confidence as a Performer (Appel 1974) was used to reveal any changes in stress management, self-efficacy, and ability to regulate anxiety prior to performance, while the State-Trait Anxiety Inventory (Speilberger, Gorsuch, and Lushene 1970) was used to reveal any changes in general anxiety and performance anxiety over the course of the study.

At the end of the study, subjects made a final evaluation of the study (appendix M) and took part in a final interview given by the researcher and recorded on audiotape. These evaluations were used to assess the participants' general perspective on whether imagery and/or relaxation techniques had any effect on their performance ability in terms of memory, concentration level, anxiety regulation, and/or confidence. All evaluations included both written commentary by the subjects and yes or no questions which can be analyzed quantitatively.

Research Design

A complete outline of the events in each session with a list of mental practice assignments foreach week of the study is included in the Outline of Research Procedure in appendix A. The order of events in Session I was as

follows: pre-tests using the Personal Report of Confidence as a Performer (Appel 1974) found in appendix C and the STAI State/Trait Anxiety Inventory (Speilberger, Gorsuch, and Lushene 1970) found in appendix D; videotaped performance in front of all of the subjects; the listing by subjects of goals for the final performance (appendix E); selection of imagery scenes (appendix J); introduction to deep breathing and relaxation (appendices G and H); imagery exercise (appendix I); completion of the imagery worksheet (appendix J); and the handout of mental practice logs for the first week (appendix K), progressive relaxation assignments for the entire study (appendix L), and the form for self-evaluations of videotaped performances (appendix F).

During Session I, the researcher gave a rationale for the use of imagery, mental practice, and relaxation techniques. She also described the purpose of the study and the design of the study. The subjects signed an informed consent form (appendix B) and completed the Personal Report of Confidence as a Performer (appendix C) and the State-Trait Anxiety Inventory (appendix D) as pre-tests prior to their performance. The participants then performed for each other in front of the other participants with the researcher present.

The subjects were then introduced to the technique of deep breathing, followed by an introduction to the technique of progressive relaxation. The instructor read a script regarding the rationale behind using progressive relaxation and describing the procedure, and the subjects practiced tensing and relaxing each of their sixteen muscle groups twice in sequential order (see appendix H).

The scripts for the introduction to deep breathing, progressive relaxation, and imagery may be found in appendices G, H, and I, respectively. The script for progressive relaxation was modified from the instructions given in a manual on training individuals in progressive relaxation (Bernstein and Borkovec 1973). All imagery scripts were modified from the scripts proposed by Richard Suinn for the introduction of visuo-motor behavior rehearsal, or VMBR (Suinn 1994). More explanation for the rationale behind the use of VMBR and progressive relaxation techniques may be found in the section on relaxation techniques in chapter II, "Related Literature."

All subjects filled out an Imagery Exercise Worksheet in which they chose a relaxation scene and a successful performance scene based on real events from their life (appendix J). The relaxation scenes were used to help subjects learn how to use imagery to increase relaxation. The successful performance scene was used to help the subjects to become aware of the emotional and physical components of a successful performance so that they could imagine those same feelings during the imagery of an upcoming performance. The subjects visualized the relaxation scene and then transitioned into a visualization of the successful performance. During the imagery exercise, the subjects continued to assess the amount of tension in their muscles and relaxed them if necessary.

The subjects were instructed to use deep breathing during the next week during their individual practice, prior to beginning the progressive relaxation worksheets. On the same worksheet in which they identified the two scenes, the participants also filled out a survey noting how relaxed they were as well as how

clear and controlled their imagery was on a scale of 1 to 10 (see appendix J). This worksheet was handed out to the subjects again the following week so that they could fill out new imagery scenes and keep a record of the changes in relaxation and imagery ability.

The relaxation exercises for individual practice (appendix L) were modified from the exercises included in *Seven Steps to Peak Performance* (Suinn 1986). All participants were given an assignment that listed three stages for using progressive relaxation; they were to keep a log assessing their level of tension and go to the next stage when ready. During the first week, the participants were instructed to follow the progressive relaxation instructions beginning with Stage I and fill out the training log to keep track of their degree of relaxation after the exercise, using the numbers from -10 to +10. They moved on to Stage II, and then on to Stage III, when their training log indicated a score of +7 or better at each stage. The participants were expected to be at different stages in progressive relaxation each week, and their pace at the different stages was maintained on an individual basis.

In addition to the relaxation exercises, the participants were also given specific assignments for each of the three days of mental practice. They engaged in mental practice for 15- to 20-minute periods. A 15- to 20- minute study period was chosen because of the Driskell, Copper, and Moran (1994) estimation that an optimal period of mental practice lasts 20 minutes. This study and its findings are described in the section on sport psychology and mental practice in chapter II on "Related Literature."

The participants were told that if the assignment did not take 15 minutes to complete, they should repeat the assignment for a minimum of 15 minutes. For example, on the first day, the participants were required to read over the score while hearing it in their mind. The duration of their pieces was three to ten minutes, so if a piece was five minutes long, for example, they were to read over the score and mentally hear it three times.

On the second day of practice, the subjects read through the score while hearing it in their mind and silently playing through the piece, using the correct fingering. The use of simulated movement has been supported in research studies by Mendoza and Wickman (1978) and Ross (1985) as a way to augment the effects of mental practice. In chapter II on "Related Literature," the Mendoza and Wickman (1978) study is described in the section on mental practice and sport psychology, while the Ross (1985) study is described in the section on mental practice and music.

On the third day, the participants read through the score while hearing it in their mind and imagining using the correct fingering, rather than physically playing it silently. The researcher believed that it was important to move away from actual simulated movement in mental practice to a more purely mental practice during the first week of the study. By imagining what it felt like to tap the correct fingering, the subjects were mentally employing the visual, aural, and kinesthetic senses.

The order of events in Session II was as follows: identification of a new performance scene (appendix J); a progressive relaxation (appendix H) and

imagery exercise (appendix I); a videotaped performance in front of the researcher; handout of mental practice assignments and practice logs for the second week of the study (appendix K); handout of Stage I Imagery Exercises (appendix M); completion of the imagery exercise worksheet (appendix J); and self-evaluations from the videotaped performances (appendix F).

During Session II, the participants went through a progressive relaxation exercise similar to the first session, but with each muscle group tensed and relaxed only once. They also went through a guided imagery session which included the use of progressive relaxation (see appendix I for the script for Session II). During this imagery session, the participants used the worksheet from the last imagery session to identify a new performance scene which would be useful in reaching one of their final performance goals. They also used the successful performance scene from the prior session during the imagery routine. Following the imagery session, each participant performed for the researcher. These performances were again videotaped to allow the performers to fill out their own self-evaluations.

During the second week, the participants began doing imagery on their own during individual practice sessions. Imagery worksheets from Richard Suinn's *Seven Steps to Peak Performance* (Suinn 1986) guided them through three stages of VMBR (visuo-motor behavior rehearsal). They began with Stage I of the imagery exercises (appendix M). This stage of imagery incorporated the use of the relaxation scene chosen during Session I.

The second week of mental practice required the subjects to come up with new interpretive ideas during their individual mental practice sessions. These ideas could have been related, for example, to the shape and direction of each phrase, timing and use of rubato, dynamic changes, the relative tension and repose within harmonic progressions, character and mood changes, and changes in articulation, dynamics, and tone. These ideas were written down by the participants in space provided in their practice logs (appendix K).

On day one of the second week, the participants were required to practice the piece mentally without looking at the score, while imagining what the keys looked like under their fingers. They were told to only go through one section at a time, and to go back to the score if there was a section where every note was not clear.

On day two of the second week, the participants were to begin visualizing the score in their mind and hearing it as they went along. The practice log advised them to do only one section at a time, and to use very slow practice at first to ensure that the score was clear all the way through. If the score was not clear all the way through, they were asked to look at the music and write those spots down in their practice worksheet. They could also hear the piece at performance tempo if the score was clear in their mind, even if they were not able to play it up to tempo. If there were sections that they wanted to play faster, but could not do so yet on the instrument, they were to imagine those at a faster tempo.

On the third day of the second week, subjects were asked to write down three specific spots with which they were having difficulty in their practice log. During their mental practice sessions, they were to practice their pieces in two ways. First, they reviewed the entire piece while looking at the score, hearing it in their mind and imagining how it felt to play it perfectly. Second, they worked in detail on the three "difficult spots" that they had noted on their own. Through mental practice, they tried to decipher if the problem was primarily musical/interpretive, technical (physical difficulties), related to memory, or other. They wrote down how they mentally practiced those spots, and were advised to use physical practice in combination with mental practice on these areas. If the problem was technical, their practice log instructed them to decide during physical practice what physical motions would help to play it perfectly. During mental practice, the subjects imagined going through those motions successfully.

The events in Session III included a progressive relaxation and imagery exercise (appendices H and I) followed by a videotaped performance in two small groups; completion of the Imagery Exercise Worksheet (appendix J); and self-evaluations from the videotapes (appendix F). Subjects were given practice logs and mental practice assignments for the third week (appendix K) as well as Stage II of the Imagery Exercises (appendix M).

During the third group session, the number of muscle groups tensed and relaxed during the progressive relaxation exercise was reduced to seven. During the imagery exercise, the subjects initiated relaxation on their own and again incorporated the successful performance scene which they chose at the beginning

of the study. They envisioned the successful performance of a particular skill, which was chosen individually by the subjects based on one of the goals they listed for their final performance. Following the imagery rehearsal, the participants divided into two groups of two to three people. They performed again for their small group and later self-evaluated their performance from the videotape.

The subjects began to incorporate more imagery work in their individual practice sessions during the third week of study. In Stage II of the Imagery Exercises (appendix M), the participants used both the relaxation scene and the successful performance scene chosen during Session I. Then the participants performed more detailed mental practice in which they imagined playing individual sections, starting at the last section of the piece. Without looking at the score, but visualizing the score in their mind, they started in the last section and played through it mentally, then started on the second-to-last section and played through to the end, and so on, until they had mentally played through the whole piece perfectly.

The following events occurred during Session IV: two progressive relaxation routines (appendix H); an imagery exercise (appendix I); completion of the Imagery Exercise Worksheet (appendix J); a videotaped performance in front of the entire group of subjects; and self-evaluations from the videotape (appendix F). Mental practice assignments and practice logs (appendix K) and the Stage III Imagery Exercises (appendix M) were handed out to all participants at the end.

During the fourth group session, each subject designed his own pre-performance routine that he was to use the night before the final performance and immediately prior to the actual performance. Some sport psychologists have proposed that the use of imagery at night before going to bed is an optimal time for imagery rehearsal because most people are more relaxed, less rushed and are able to spend uninterrupted time in a quiet location (Suinn 1994).

The session incorporated two progressive relaxation exercises, the first of which involved tensing and relaxing only four muscle groups. The second exercise involved the use of a recall procedure to achieve relaxation. In this type of procedure, the subjects did not tense the muscle group first, but instead focused on any tension present in the muscle group and eliminated it by recalling the feelings of relaxation through release. The participants used relaxation through recall on their own during the week and also used it prior to the final performance.

After the two progressive relaxation exercises, the subjects used imagery to mentally experience the successful end result of their final performance. They visualized themselves at the final performance playing the last part of the piece successfully. They saw themselves bowing for an audience who was clapping enthusiastically while they felt proud, confident, and satisfied with their performance. The last part of the routine involved a detailed rehearsal of one specific part of the piece. It was recommended for this part of the piece to be the beginning phrase, but they could have chosen a section that was particularly difficult or that they regarded as being particularly important. The subjects noted the detailed elements of the imagery routine on the worksheet in appendix J.

During the fourth week of the study, the subjects practiced this specific individualized imagery routine. They also used Stage III Imagery Exercises (appendix M) during the week. During Stage III, the participants chose one of four goals listed: developing control over a "winning feeling;" removing muscular tension during specific areas of the piece; practicing a part of the piece; or practicing key phrases to spark a specific attitude or mindset during performance. They then followed the procedures listed for the chosen goal.

The three mental practice sessions were designed by the subjects themselves according to what had seemed most effective for them during the past three weeks. They kept a record of the type of mental practice used in their practice log (appendix K).

During the final session, before the recital began, the participants filled out a second Personal Report of Confidence as a Performer (appendix C) and State/Trait Anxiety Inventory (appendix D) as post-tests. They then engaged in their own "pre-performance imagery routine" during the minutes before the final performance. This routine involved imagining the successful end result of the performance followed by detailed mental practice of a specific part of the piece. The participants then completed a final Imagery Exercise Worksheet. For the final performance of Session V, the participants performed their piece in the departmental piano recital, which was videotaped. After the recital, the researcher met with all five participants for a final interview to elicit verbal commentary from the subjects regarding their perception of the techniques used in the study.

At this final session, the subjects also filled out a final evaluation to determine their general perceptions of the overall effectiveness of the research procedures. They evaluated the amount of anxiety, confidence, or preparedness which they felt during the final performance as compared to their first performance in Session I. They also looked over their list of goals made at the beginning of the study and determined which, if any, of the goals were met over the course of the study. Finally, they named which, if any, of the following factors were influenced most by the study: memory, concentration, anxiety regulation, or confidence level (see appendix N).

Instrument Description

The following sections describe the two instruments which were used for statistical analysis in the study: the Personal Report of Confidence as a Performer, or PRCP (Appel 1974) and the State/Trait Anxiety Inventory, or STAI (Spielberger, Gorsuch, and Lushene 1970). The PRCP is found in appendix C, and it was used to determine any changes in the level of self-confidence and anxiety prior to piano performance. The State/Trait Anxiety Inventory, found in appendix D, was used to determine any changes over the course of the study in both general anxiety level and anxiety level prior to performance.

Personal Report of Confidence as a Performer (PRCP)

The Personal Report of Confidence as a Performer was adapted by Sylvia S. Appel (1974) from Paul's (1966) Personal Report of Confidence as a Speaker. Paul (1966) presented the first controlled group study of performance-anxiety reduction. He investigated the relative effectiveness of psychoanalytic techniques, systematic desensitization, and a placebo treatment in reducing anxiety from public speaking performance. The PRCP was also used by Charlotte Sibley Whitaker (1984) on her dissertation on the modification of performance anxiety among pianists.

State-Trait Anxiety Inventory (STAI)

The State-Trait Anxiety Inventory (STAI) is a self-evaluation questionnaire which was developed in the fall of 1964 at Vanderbilt University by C.D. Spielberger and T.L. Gorsuch. In creating the test, the primary objective was to develop an instrument with which to measure both state anxiety and trait anxiety in normal adults. The instrument is divided into two sections: the STAI A-Trait, and the STAI A-State. Each of the two scales consists of twenty questions, with the A-State being concerned with how the subject feels at a particular time, and the A-Trait instructions requesting the person to indicate how he generally feels at all times.

> State anxiety is conceptualized as a transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity. A-States may vary in intensity and fluctuate over time. Trait anxiety (A-Trait) refers to relatively stable individual differences in anxiety proneness, that is, to differences between people in the tendency to respond to situations perceived as threatening with

> elevations in A-State intensity (Spielberger, Gorsuch, and Lushene 1970, 31).

In the context of musical performance anxiety, trait anxiety is defined as a relatively stable and enduring aspect of a musician's anxiety proneness, while state anxiety is defined as the relative intensity of a musician's anxiety at the time of a particular event such as a musical performance (Niemann, Pratt, and Maughan 1993). Researchers generally agree that music performance anxiety is highly correlated with state anxiety (Lehrer, Goldman, and Strommen 1990).

The possible range of scores for each of the STAI forms is a minimum of twenty to a maximum of eighty points. Each form asks the subject to rate herself on a four-point scale. Categories for the A-State scale are: 1. Not at all; 2. Somewhat; 3. Moderately so; and 4. Very much so. The categories for the A-Trait scale are: 1. Almost never; 2. Sometimes; 3. Often; and 4. Almost always (Spielberger and Gorsuch 1970, 4-5).

Normative data for the STAI is available for a large sample of college freshmen, undergraduate college students, and high school students. Data is also available for a wide range of individuals such as psychiatric patients, medical and surgical patients, and prisoners. The means, standard deviations, and alpha reliabilities for the norms of the different groups are available in the STAI manual (Spielberger and Gorsuch 1970, 5).

Definitions of Terms

Autogenic therapy. A therapeutic system which makes use of body awareness and relaxation exercises. The exercises consist of simple formulas repeated silently, such as warmth and heaviness in the limbs. Practitioners carry out the exercises in a state of passive concentration in which they focus on different organs of the body to be aware of the bodily sensations associated with relaxation.

Biofeedback. "A training process by which an individual can learn to regulate his physiological functions. Information is delivered to an individual about his ongoing biological process. Usually employs sensitive electronic instruments which detect minute changes in muscle tension, skin temperature, or brain waves, and which filter, amplify, and display these to the person" (Danskin and Crow 1981,109).

Body image. The picture or mental representation one has of his own body at rest or in motion at any moment.

Differential relaxation. "A minimum of tensions in the muscles requisite for an act, along with relaxation of other muscles" (Jacobson 1929, 83).

Eidetic image. "A projected image (generally visual) of such vividness, color, clarity, and differentiation of form as to seem to the fully waking subject (usually a child) like a percept" (Holt 1964, 255).

EMG (Electromyogram). Conversion of electrical impulses produced by skeletal muscle activity into either visual tracings or aural signals.

External imagery. A type of visual imagery in which the practitioner imagines seeing himself perform, similar to watching a video of his performance.

Image. "Generic term for all conscious subjective presentations of a quasi-sensory but nonperceptual character" (Holt 1964, 255).

Imagery. A sensation in the absence of the object or situation that usually results in that perception. (Also referred to in the research literature as *visualization, symbolic rehearsal, modeling, covert practice, cognitive rehearsal, imaginal practice, visuomotor training, introspective rehearsal, implicit practice, ideomotor training, conceptualization, ideational functioning, introspection, imaginary practice, implicit practice,* or *conceptualizing practice*).

Internal imagery. A type of imagery in which the practitioner mentally rehearses the sensations of performance as if inside his own body. In a visual internal imagery perspective, the practitioner imagines seeing visual input as it occurs in a performance, such as seeing the instrument, his hands, the stage, or the audience while mentally performing.

"In vivo" desensitization. A form of systematic desensitization (see below) in which a person is introduced to the anxiety-provoking situation in reality rather than imagination.

Kinesthetic imagery. A type of imagery in which the practioner experiences the feelings and sensations of movement.

Meditation. "The process of emptying the mind of thoughts, or concentrating the mind on one thing, in order to develop the mind or spirit, aid contemplation, or relax" (ed. Soukhanov 1999, 1124).

Mental Practice. "The symbolic rehearsal of a physical activity in the absence of any gross muscular movement" (Richardson 1969). (Also referred to in the literature as *symbolic rehearsal, conceptualizing practice, introspection,* or *mental imagery*.)

Percept. "Something that is perceived by the senses" (ed. Soukhanov 1999, 1338).

Progressive muscular relaxation (PMR) or *progressive relaxation*. A method designed by Edmund Jacobson (1929) which teaches relaxation of each of the muscles of the body in sequence.

Relaxation. "1. the process of becoming or of making something less firm, rigid, or tight; 2. a lessening of the strictness or severity of regulations, restrictions, or controls; 3. a lessening or weakening of something that was previously concentrated or intense" (ed. Soukhanov 1999, 1514).

Self-efficacy. One's personal expectation of success, or confidence; "the belief that you can influence your own thoughts and behavior" (ed. Soukhanov 1999, 1625).

Self-talk. The conversation that one has with one's self. It may be of a covert nature or it may actually be overt, where individuals actually speak to themselves verbally. The frequency and content of self-talk develops a mind set within which an athlete performs. The skill of "intentional thinking" develops thought patterns that are based on self-enhancing thoughts rather than self-defeating ones (Green 1994a).

Systematic Desensitization. "A behavior therapy technique in which hierarchies of anxiety-producing situations are imagined . . . while the person is in a state of deep relaxation. Gradually the situations become dissociated from the anxiety response" (Atkinson, Atkinson, and Hildegard 1983, 640).

Visual imagery. A type of imagery in which the visual sense is employed. External visual imagery involves "seeing" oneself perform as though watching a video of one's performance. Internal visual imagery involves seeing visual input as it occurs in performance; the musician employing imagery might see their instrument under his hands, the lighting on the stage, or the audience.

VMBR (*visuo-motor behavior rehearsal*). An imagery rehearsal procedure devised by Richard Suinn which precedes imagery with relaxation; "a covert activity whereby a person experiences sensory-motor sensations that reintegrate reality experiences, and which include neuromuscular, physiological, and emotional involvement" (Suinn 2001, 499).

Limitations of the Study

MacKay (1981) examined the methodological and conceptual problems which have made it difficult for researchers to prove the hypothesis that mental practice facilitates skill. First, observational difficulties are inherent in mental practice studies, because mental practice is difficult to control and observe. Whether or not subjects are actually participating in mental practice cannot ever

be verified, even if the mental practice is directed or supervised. Additionally, it is impossible to ascertain what kind of mental practice is being done. The only way to study mental practice or imagery is to infer the process and its results from subsequent behavior.

Additional limitations of the present study include the fact that this study does not include a performance error count or an observational judgment about whether performance has been assisted by the treatment. Performance analysis will be based solely on the performers' evaluation of their playing. Because of this requirement, it is impossible to make a statistical assessment regarding whether musical performance has been assisted by the treatment program. The study will show only the performers' perceptions of their musical progress and associated levels of confidence, memory stability, and concentration level. Anxiety regulation will be partly evaluated based on the performers' personal assessments as well.

The present study did not include a control group. Instead, one group of subjects engaged in imagery, relaxation techniques, and mental practice as an additional type of performance preparation. It would be difficult to assess whether a reduction in anxiety, an increase in self-confidence, and the completion of artistic performance goals would have resulted from the repetition of performance alone without the addition of imagery and relaxation techniques. Instead, performance change was measured according to subjective self-evaluations. The participants themselves were asked whether the techniques of imagery and relaxation had a positive effect on their performances.

This study is limited to those graduate piano performance majors at the University of Oklahoma who are the subjects of the study. It may not be possible to generalize the results to a larger population.

Organization of the Study

This study has been organized into five chapters, a bibliography, and appendices. Chapter II is a review of the related literature. Detailed information is presented on research that has taken place in the fields of sport psychology and music. The reviewed literature contains research on imagery, mental practice, and relaxation techniques, including Jacobson's Progressive Muscular Relaxation (PMR) technique (1929). Current theories on imagery are reviewed and the purported benefits and practical applications of imagery are listed along with supporting research.

Chapter III presents the results of the study. It contains statistical data from the Personal Report of Confidence as a Performer (appendix C) and the State/Trait Anxiety Inventory (appendix D), as well as from videotape evaluations (appendix F), practice logs (appendix K), and the final evaluation (appendix N). It also contains descriptive data including subject comments from the videotape evaluations (appendix F), imagery exercise worksheets (appendix J), practice logs (appendix K), the final evaluation (appendix N), and the final interview. Important similarities among the participants' comments were analyzed and data is presented according to how it relates to the research questions. These research questions are concerned with whether the use of

imagery, mental practice, and relaxation techniques had any impact on confidence, concentration, memory, anxiety, and the performers' evaluation of the overall success of the performance. Statistical results from the State/Trait Anxiety Inventory (STAI) and the Personal Report of Confidence as a Performer (PRCP) demonstrate changes in the participants' anxiety level, while answers in the imagery exercise worksheets demonstrate any changes in imagery and relaxation ability over the course of the study. The results of the final evaluation and the final interview illustrate the participants' perception of the usefulness of relaxation, mental practice, and imagery at the end of the study. Chapter IV contains a summary and recommendations for further study.

At the conclusion of chapter IV, a bibliography is included and is followed by the appendices. The appendices contain an outline of the research procedure; an informed consent form; the Personal Report of Confidence as a Performer (PRCP); the State/Trait Anxiety Inventory (STAI); the list of final goals for performance; the form for self-evaluations of videotaped performances; deep breathing, progressive relaxation, and imagery scripts for the group sessions; imagery exercise worksheets; practice logs and mental practice assignments; relaxation and imagery exercises for individual practice; and a final evaluation.

CHAPTER II

REVIEW OF THE LITERATURE

Relaxation Techniques

Most performers involved in the fields of sports or music experience at least some anxiety during competition or performance. According to Jones, Hanton, and Swain (1994), the ability to control anxiety to manageable proportions, and even to use it to one's advantage during performance, is a characteristic of the most elite athletes. Many sport psychologists identify being relaxed during performance as one characteristic of peak performance (Jackson 1992).

In a series of interviews conducted by Jones and Hardy (1990), all six elite athletes interviewed used some form of relaxation technique even though they had not been formally trained in the technique. The use of relaxation seemed to evolve instinctively as a natural form of preparation for competition. The performers used various relaxation techniques including deep breathing and imagery. Kolonay (1977), Suinn (1972a), and Weinberg, Seaborne, and Jackson (1981a) found that relaxation preceding imagery is more effective than imagery alone. Relaxation aids imagery by

reducing distracting somatic tension. It also eliminates cognitive distractions by calming and centering the mind.

The relationship between arousal and performance is a complex one. It is important for musicians to be able to assess whether they should seek a higher or a lower level of arousal prior to performance. For athletes who need an increase in arousal, autogenic training and biofeedback to increase pulse rate can be useful. For individuals who need a lower level of arousal, various relaxation exercises such as Progressive Muscular Relaxation (PMR) may be used. Techniques such as meditation and yoga may also help to quiet the mind.

In regard to the level of arousal necessary for optimal performance, the Yerkes-Dodson Law states that "complex tasks are performed better when one's drive is low, while simple tasks are performed better when drive is high" (Oxendine 1980, 104). Therefore, drive (which is related to motivation or arousal) may result in impaired performance if it is too high or too low for the task at hand. Oxendine added further principles to this widely accepted generalization in an article titled "Emotional Arousal and Motor Performance" (1980). On the basis of research evidence, scientific literature, and empirical observation, he offered three further generalizations on arousal and performance in the area of athletic performance:

> 1. A high level of arousal is essential for optimal performance in gross motor activities involving strength, endurance, and speed.
> 2. A high level of arousal interferes with performances involving complex skills, fine muscle movement, coordination, steadiness, and general concentration.
> 3. A slightly-above-average level of arousal is preferable to a normal or sub-normal arousal state for all motor tasks. (Oxendine 1980, 104-105)

In the field of sports, Oxendine states that many situations can be cited in which highly motivated or aroused individuals performed less well on complex tasks. The interference effects of high emotional arousal appear to have greater detrimental effects on tense or highly anxious people in comparison with less anxious people. Carron (1965) conducted a study comparing high anxious and low anxious subjects using a shock stresser on male college students in a balancing task. He concluded that in tasks of low difficulty, high anxious subjects were found to be superior, while in tasks of high difficulty, low anxious subjects proved to be superior.

The performance of music is a highly complex task, and as such, a high level of arousal may be considered to be more dangerous than a low level. Most musicians are excited before a performance because of the anticipation of playing in front of other people, and additional arousal is often counter-productive. The use of relaxation techniques in these instances can be especially beneficial for performers who need to lower their level of arousal.

Wenz and Strong (1980) propose that the differences in performance among athletes of relatively equivalent skills "appear to rest on a person's ability to cope with the perceived stress of the competitive situation. The stress reaction produces an anxiety syndrome that has specific physiological as well as psychological components that inhibit performance" (p. 328). The authors designed a psychologically-based training program to complement physical training of athletes, which they believe to be particularly helpful to those who experience a level of tension and anxiety that interferes with maximum performance. Their procedure consisted of individualized home practice in different variations on the following activities: 1. relaxation training,

using Jacobson's progressive relaxation; 2. autogenic phrases such as the repetition of the words warm, serene, calm, and confident; and 3. imaging, including pleasant images, the mental rehearsal of specific skills, and mental rehearsals at slow motion, normal speed, and accelerated speed.

Many sport psychologists advocate the use of relaxation techniques prior to both imagery rehearsal and actual performance. Training in relaxation may be used to reduce performance anxiety, remove localized tension, promote sleep before competition or performance, and teach athletes and musicians how to regulate muscular tension. In addition to its benefits in performance, the regular use of relaxation techniques may reduce the detrimental effects of stress on a musician's daily life. Musicians can gain many benefits from the regular use of relaxation techniques, even without the accompanying use of imagery.

Imagery rehearsal by athletes is usually preceded by relaxation techniques to help them associate the simulated performance with a state of calmness and control. Korn (1994) and Miller (1994) both promote the use of relaxation prior to imaging. Miller (1994) states that before beginning relaxation, the athlete should bring to mind a specific upcoming event where he wants to perform at peak condition, and develop a clear idea of the outcomes he wants to produce.

It is important during imagery rehearsal to imagine feeling calm and in control while onstage. Mentally rehearsing these emotions enables musicians to attain them more easily when the situation becomes a reality. Sport psychologists such as Richard Suinn state that they have found the quality of imagery to be more impressive following

deep muscle relaxation. At that point, athletes are able to manipulate all of their senses, and emotional content, in imagery (Suinn 1980a).

The techniques of relaxation may be divided into two categories (Harris 1986). The first category of techniques works from "mind to muscle" and includes the cognitive or mental approaches to relaxation such as meditation, autogenic training, and imagery. This group of techniques is sometimes called "mental" relaxation as opposed to "physical" relaxation. When a performer mentally tells the body that it is relaxed, the subsequent relaxation is a result of imagery.

The "muscle to mind" techniques address the bodily aspects of relaxation. Stretching is one way to release tension in the body, as many practitioners of yoga have found. Students may do simple stretches before a practice session, such as extending the arms overhead or doing a forward bend, in order to relax the muscles and focus the mind. Jacobson's (1929) progressive relaxation also falls into this category.

Certain types of relaxation techniques seem to work better for specific types of anxiety. Some psychologists recommend that the relaxation treatment be matched with the form of anxiety experienced, a theory that has come to be known as the "matching hypothesis." Cognitive anxiety is associated with feelings of fear, anxiety, or emotional arousal, and should be treated with a mental relaxation technique such as meditation. Physiological changes such as shallow breathing, shaking hands, or sweating are symptomatic of somatic anxiety, and should be treated with a physical relaxation technique such as progressive muscular relaxation. Burton (1990) has suggested that physical relaxation techniques, as well as deep breathing and autogenic training, can be used to offset

somatic anxiety. For cognitive anxiety, transcendental meditation and hypnosis with an imagery or suggestion component was recommended.

Benson (1987) theorized that when the mind is relaxed, an individual can learn to control negative or distracting thoughts originating in the judgmental left brain. The left side of the brain is responsible for rational analysis and problem-solving, while the right side of the brain concentrates on creative thought processes. According to Benson, the analytical qualities of the left brain may overpower a new thought, prohibiting creative expansion. His "relaxation response" was devised to reduce anxiety and elicit positive thought patterns.

The response is invoked by concentrating on deep breathing while mentally repeating a specific word such as "peace." As the mind begins to relax, it becomes open and uncluttered by distracting thoughts. For musicians, a passive approach to practicing may be developed by consciously relaxing before the practice session. This can lead to such absorption in the learning process that stressful or anxious feelings are overlooked. Perhaps this is the most effective type of practicing if it can lead to enhanced creativity and more focus on musicianship.

Some teachers promote meditation, in addition to deep breathing, to achieve a relaxed and focused state. Meditation sometimes involves concentrating on one's breathing. Meditation is, according to Timothy Gallwey (1976), nothing more than pure concentration of the mind. It can help people to learn to relax, concentrate, and increase their awareness of all sensory experience, including aural, visual, and physical perception.

In a pedagogical article entitled "Practice as Meditation," Schwarz (1976) advocated the use of meditation to maintain a very relaxed but alert state of mind while practicing one's instrument. This mental and physical state is ideal for musical practice and achievement because it allows students to "let go" during performance. He stated that letting the music "play itself" is more successful than focusing one's attention on analyzing what one is doing, which often causes difficulty in passages that have been effortless during practice (p. 46). The meditative techniques that he advised students to practice consisted of both progressive relaxation techniques and an approach that emphasizes body awareness rather than accuracy:

> 1. Take a seated position, with the body erect but not stiff. To induce a relaxed/alert condition of the body, begin the process of progressive relaxation, systematically relaxing each area of the body starting with the feet. Tell yourself, 'Feet, relax; ankles, relax; calves, relax;' etc., until the entire body is in a state of relaxation. . .
> 4. Let all of the bodily actions proceed on their own, without forcing. (Schwartz 1976, p. 46).

He then advised students to think about the large muscle groups, followed by the small groups. They should then think of the sound that is produced, and finally let all of the bodily actions proceed on their own, without forcing. He advised continuing this procedure for 10-15 minutes once a day.

Progressive Muscular Relaxation (PMR)

Progressive Muscular Relaxation (PMR), a technique devised by Edmund Jacobson (1929), requires the student to first tense each muscle in his body and then let it relax. This entails the systematic focus of attention on various gross muscle groups

throughout the body. The muscles are trained to become sensitive to any level of tension so that they may release that tension. As the muscles in the body are relaxed, the mind becomes calm and focused. This is probably the most common form of relaxation used in sport, and all modern progressive relaxation techniques are variations of Jacobson's PMR.

The technique of PMR was designed to train tense and nervous individuals to attain a higher degree of relaxation. In his book *Progressive Relaxation* (1929), Jacobson proposed a procedure in which trainees are taught to localize their tensions and then modify them on their own. This highly technical book was simplified for laymen in a subsequent book by Jacobson titled *You Must Relax* (1957).

Jacobson believed that nervousness and physical tension was a cause of many health problems, and he observed that even a person lying on a couch quietly for hours could still remain nervous and sleepless. Jacobson claimed that this sleepless person could get rid of his residual tension by cultivating a greater degree of bodily relaxation. He defined tension as "the effort that is manifested in shortening of muscle fibers" (Jacobson 1957, vi). Practitioners of progressive relaxation are trained to relax each muscle group in their body in sequential order. Through daily practice, they will eventually be able to maintain only the minimal amount of tension required for the task at hand.

Training usually begins by lying comfortably on one's back in a quiet room, with the legs uncrossed. Subjects in the present study first created a static, or tonic, state of tension in the arm by making it rigid without moving it, then stiffening it less and less past the point of apparent relaxation. Later, trainees should be able to relax

without contracting first. Through this process, trainees should become aware of the difference between flexing the biceps, which is an active process, and relaxing the biceps, which is passive and requires no action. The trainee begins to learn how to relax by contrasting the feeling of "doing" or flexing with "not doing" or laying passively (Jacobson 1957).

The last phase of training in progressive relaxation is learning to replace excitement and tension with quietness in the nervous system. The ability to be partially relaxed while engaged in daily activities is the most beneficial aspect of this training for performers. Jacobson used the term "differential relaxation" to refer to relaxing all muscles other than those needed to perform the task at hand (Jacobson 1957).

Kukla (1976) employed progressive relaxation with high school baseball players, and reported a reduction in state anxiety as well as improved batting performance under stressful conditions when compared to a control group. Lanning and Hisanaga's (1983) study of high school volleyball players similarly found lowered state anxiety in a progressive relaxation group when compared to a control group, together with improved serving performance.

Visuo-Motor Behavior Rehearsal (VMBR)

Visuo-motor behavior rehearsal (VMBR) is an imagery rehearsal procedure developed for athletes by Richard Suinn. The present study modeled its combination of progressive relaxation followed by imagery after Richard Suinn's explanations of how to teach VMBR (Suinn 1994). The procedure combines both imagery and relaxation,

and the technique evolved out of Suinn's modifications of desensitization therapy. Relaxation is an essential step in VMBR and always precedes imagery. VMBR is defined by Suinn (2001) in the following way: it is "a covert activity whereby a person experiences sensory-motor sensations that reintegrate reality experiences, and which include neuromuscular, physiological, and emotional involvement" (p. 499).

The technique of visuo-motor behavior rehearsal (VMBR) has a standardized format. The method can be divided into three steps: relaxation, the practice of imagery, and the use of imagery for strengthening psychological or motor skills. It consists of an initial relaxation phase followed by the visualization of two events: an entire performance during a specific situation and the performance of a particular skill during a stressful situation (Suinn 1972b).

During VMBR, Suinn states, imagery is especially clear, vivid, and similar to the actual experience, to the extent that it often resembles dreams that take place during sleep. The main difference between dreams and imagery are that imagery rehearsal is subject to conscious control. In contrast to a mental practice instruction such as "Close your eyes and try to imagine yourself playing the B section," VMBR seeks a full-dimension re-experiencing of the event, complete with multisensory experiences.

Suinn began his behavior-modification techniques with athletes in about 1971, when he was adapting behavioral therapies for use with nonpathological clients. One client he worked with was an executive who had great difficulty speaking in front of a group. Suinn taught him an "imagery-rehearsal" technique, which was to be used in conjunction with relaxation as a method for reducing stress. Following a session of progressive relaxation, the client pictured himself speaking in front of an audience of

supervisors in so much detail that the exact words of the speech had to be formulated. After seeing the success of this method, Suinn began to think about how the method could be applied to developing or strengthening other skills in normal individuals (Suinn 1980b).

A manual by Suinn (1986) called *Seven Steps to Peak Performance: The Mental Training Manual for Athletes* was developed to train athletes in the use of relaxation and VMBR. It first introduces relaxation by using breathing techniques, imagining each muscle relaxing individually, and using a "cue phrase" invented by the individual. The manual contains logs in which athletes can write about their experiences and rate the success of the experience so that they may learn the techniques that work best for them.

One study often cited to demonstrate the effects of VMBR was conducted by Suinn (1972a) with skiers at Colorado State University. The skiers were divided into two groups, matched equally for ski-racing ability. One group received imagery training through VMBR, while the other was a control group. The first stage of relaxation consisted of a brief version of Jacobson's progressive relaxation, in which the athletes tensed and relaxed muscle groups for about 20 minutes. The skiers then practiced their athletic skills by using mental imagery. The final step was to use imagery to practice a specific skill. The Colorado State skiers practiced racing techniques, course concentration, and improving their memorization of courses through VMBR. The method worked so well that the coach, impressed by the improvement in the VMBR groups, decided to race these skiers instead of the skiers from the matched control group (Suinn 1980b). The scientific study became inconclusive, but is still cited in many reports as a common-sense demonstration of the benefits of VMBR.

Some studies have been designed to compare the use of relaxation or imagery used alone versus the combination of the two treatments. Kolonay (1977) divided subjects into groups who practiced relaxation, visual imagery, or VMBR, with the VMBR group listening to a 10-minute relaxation and free throw audiotape prior to each of fifteen basketball practice sessions. The other groups listened to either the relaxation tape alone, the imagery tape alone, or engaged in irrelevant activity. Only the VMBR group showed a significant increase in pre- to post-test percentages.

Weinberg, Seabourne, and Jackson (1981a) replicated Kolonay's study, but tested karate performance. The results indicated that the VMBR and relaxation groups exhibited less state anxiety than did the imagery or control groups. In addition, the VMBR group displayed a significant increase in performance over all of the other groups.

Gray (1990) examined the benefits of videotape modeling in VMBR by studying racquetball players who were given a videotape that showed different views of forehand and backhand shots. The subjects were twenty-four men in a beginners' class, trained either with VMBR and videotape modeling or VMBR alone. Results showed significantly greater improvement for the videotape-augmented VMBR compared to VMBR only for the forehand shots, although both groups did improve across time.

John F. Lane (1980) states that there are four benefits which can be obtained, either singly or in combination, from VMBR training: relaxation and anxiety reduction, error correction, concentration, and skill development. He cites the increased ability to relax and the increased ability to concentrate as the skills most often reported by athletes who have been trained in VMBR. These two skills make possible the

identification of errors and their subsequent correction through mental practice, which is the third most often cited benefit of VMBR.

A study by Nideffer (1971) trained A.A.U. competitive divers to use VMBR to rehearse the technical aspects of their dives. These included such technical aspects as body movement and relationship of body position to the position of the water. Subjects practiced the VMBR procedure continuously for one month, both at home and for about ten minutes at the start of pool practice. Nideffer reported that there were more dives completed in practice following VMBR, even though some of the time was now taken up by VMBR. There were also increases in the total number of new dives attempted, and a decrease in reported anxiety. These findings could be interpreted to mean that VMBR practice increased the confidence of the divers in their abilities.

As a consultant to a university football team, Titley (1980) initiated VMBR to teach his athletes stress management and skill development. He wanted to assure a standardized kicking motion, since the team's field-goal kicker had missed three field goals from within 35 yards. In the games succeeding VMBR training, the field-goal kicker began to improve on consistency and accuracy from greater distances. He became the leader in the conference in scoring, established 14 school records, and completed an NCAA field goal distance record of 63 yards.

A combination of VMBR and cognitive techniques were used by Schleser, Meyers, and Montgomery (1980) to help correct performances in two female collegiate basketball players. The program first used relaxation training and imagery to practice accurate free throws or field goals. The two subjects were then helped to use imagery rehearsal to visualize a successful scene, followed by stress inoculation. Stress

inoculation (Meichenbaum 1977) involves the preparation and use of positive self-instructional statements, such as "Stay calm," constructive self-statements to cope with errors, and self-reinforcing statements. Later the athletes used relaxation, imagery rehearsal, and self-instructional statements just prior to physical practice on the basketball court.

The two subjects included a basketball center and forward. The basketball center only wanted help with free throws, so her imagery rehearsal training was limited to free throws. The basketball forward wanted help only on field goals, so her training was limited to those. For the center, her free-throw accuracy (the treated behavior) improved from a baseline of 41.3% to 54.8%. while her field goal accuracy (the untreated behavior) was relatively unchanged. In contrast, the forward improved from 36.7% on her field goals to 52.2%, while her free-throw accuracy changed only .1%.

According to Suinn, VMBR has been a useful method for identifying what happens under game conditions. For example, a runner can use VMBR to rerun a race to determine the source of an error. He can then rerun the race in mental rehearsal, correcting the error. VMBR has also been found to be useful in practicing for transfer to performance conditions. In this sense, it can be used to practice the correct moves for a coming event. For example, members of an Olympic skiing team in 1976 used VMBR to ski the course mentally just before the event (Suinn 1980b). This type of rehearsal can also be used in musical preparation to practice technique or a general approach (such as being aggressive when starting a piece); to prepare a difficult part so thoroughly that the right moves are ingrained; to build confidence; or to obtain a sense

of being familiar with the performance venue by mentally imagining oneself performing in that venue over and over again.

Studies of VMBR appear to be more consistent than studies of other imagery practice methods, with the two strongest documentations coming from the controlled group studies of Kolonay (1977), and those of Weinberg, Seabourne, and Jackson (1981). The main advantage of VMBR for research is the fact that the VMBR technique is standardized and described in the literature.

Deep Breathing

Deep breathing is an effective way to relax the body and focus the mind, and it may be used during imagery to help athletes or musicians connect the image of an ideal performance with a relaxed state of mind. It should also be used prior to performance as a way to calm the body and focus the mind. In addition to its calming effect, deep breathing also facilitates performance by increasing the amount of oxygen in the blood, and thus carrying more energy to the muscles.

Many people use only shallow breathing in their daily life, and breathe from high in their chests rather than in their diaphragms. Under conditions of stress, the breathing pattern is often further disrupted. Performers may hold their breath or breathe rapidly and shallowly from the upper chest. When tense or guarded, people may first hold the breath and then take fast, shallow breaths. Relaxed breathing is slower and softer, and has a steady, even pattern.

Learning to take a slow, deep breath usually triggers a relaxation response. Musicians can use deep breathing in their daily life, in addition to using it while involved in imagery rehearsal. In the minutes before walking onstage prior to a performance, deep breathing can help those who are anxious and tense about the upcoming performance by lowering their arousal level. Deep breathing can also be used before beginning a practice session. Appendix G contains the script for an introduction to deep breathing that will be used in the initial stages of teaching the subjects how to relax. They will learn the technique of diaphragmatic breathing which will be used during progressive relaxation prior to mental practice sessions and imagery rehearsal.

Subjects in the present study will begin to use longer counts during the later group sessions and will begin to retain the breath between the inhalation and exhalation. To promote relaxation, students will think of a specific word, such as "calm," as they exhale. They will also imagine releasing any distracting thoughts as the air is expelled.

During the first session on deep breathing (appendix G), subjects will learn about how the diaphragm works and will learn how it feels to inhale and exhale when using deep, diaphragmatic breathing. A complete breath comes from the diaphragm, and Harris (1986) cites this as a specific type of breath that athletes should learn to use in their daily life, before practice, and before a competition.

Subjects will also learn how to do rhythmic breathing during the first session, in which a count is taken on the inhale, exhale, and on pauses between the inhale and exhale. This technique enables practitioners to pay attention to the steadiness of their

breathing and pace the breath more carefully. Articulating the rhythm of one's breathing is beneficial for two reasons: first, it focuses the mind; and secondly, it helps in maintaining a slow and constant breathing pace. Harris (1986) also names this as an important introductory technique in deep breathing. She states that some coaches and sport psychologists even "choreograph" specific breathing times into the performance of skills such as gymnastic and figure skating routines (p. 190).

An example of a music teacher and performer who incorporates yoga exercises and breathing exercises into his teaching is Sautter (1984). He teaches trumpet at Portland State University, and emphasizes that although breath control is considered to be one of the most important aspects of brass playing, it is a neglected area in brass pedagogy. He believes that it is logical to isolate breathing exercises just as teachers isolate techniques such as tonguing, lip slurs, and fingering. He then presented a detailed explanation of different types of breathing techniques used in yoga to induce a meditative state. He suggested that the student start each day with a breathing exercise to wake up the lungs, body, and mind through visualization techniques.

Relaxation Training and Systematic Desensitization

Among the many clinical uses of mental imagery, one application is in desensitizing people to anxiety-producing objects or situations (Wolpe 1973). For example, in the treatment of phobias, a helpful technique is called "systematic desensitization." In this technique, a person visualizes the feared object in

conjunction with relaxation training, until the object no longer elicits an anxiety reaction. The advantage of using imagery is that one can mentally "approach" the feared object in progressive stages, without actually having the object present.

The counter-conditioning procedures of systematic desensitization were developed by Joseph Wolpe from studies on animals and human neurosis. Wolpe's principle of "reciprocal inhibition" (1958) had the basic premise that unadaptive responses due to anxiety are learned responses, and they can be eliminated by inhibiting anxiety with a competing response.

When Wolpe discovered Edmund Jacobson's *Progressive Relaxation* (1929), Wolpe concluded that the effects which accompany deep muscle relaxation are diametrically opposed to those which characterize anxiety. In subsequent studies, Wolpe discovered the benefit of having clients imagine a progressive hierarchy of anxiety-producing scenes while continuing muscle relaxation. Systematic desensitization, therefore, includes training in deep muscle relaxation, a construction of hierarchies of anxiety-eliciting stimuli, and desensitization. In desensitization, anxiety-eliciting stimuli are gradually paired with a relaxed state through imagery.

Several research studies in the field of music have been related to the use of imagery to relieve performance anxiety. The earliest study was done by Darrell Roy Lund (1972) in which he assessed the relative efficiency and efficacy of three therapeutic techniques in the modification of performance anxiety. The treatment procedures used included the psycho-therapeutic technique of insight and the techniques of systemic desensitization and progressive relaxation. The

insight procedure included a rational discussion between the experimenter and the subjects concerning problems of anxiety in performance. Systematic desensitization was used to weaken anxiety responses by pairing the visualization of anxiety-evoking scenes with a stronger competing response achieved through muscle relaxation.

Forty-three volunteer subjects were selected from a population of 125 high school instrumental music students. These subjects scored high on a basic anxiety list and were randomly assigned to one of four treatment groups: insight therapy; systematic desensitization; relaxation with application; and a no-contact control group. The systematic desensitization and relaxation with application treatments were presented on six tape recordings. Three dependent measures were designed to evaluate the effects of anxiety reduction on the quality of music performance. These measures included a self-report measure of experienced feelings of anxiety, a performance evaluation by a panel of three judges, and a second performance measure including counting of performance errors.

In the present study, a performance error count was not used. The reasoning for eliminating this type of evaluation is that the number of errors does not always determine the quality of a performance. Judging musical performances is an inherently subjective task, especially at the highest levels of performance. For that reason, a panel of judges will not be used to determine the quality of the subjects' performances. Instead, support for the use of imagery will be found only in the subjects' comments and judgments about their own playing.

Results of Lund's study indicated that all three treatment groups demonstrated a greater percentage of anxiety reduction than the no-contact control group, and anxiety reduction was accompanied by significantly improved performance levels. This evidence indicated that anxiety responses in instrumental music performance are measurable and modifiable. The study also showed that anxiety reduction leads to improved performance.

Sylvia S. Appel (1974) designed a study on performance anxiety similar to that done by Lund. It was an experimental study on the reduction of solo performance anxiety responses of adult pianists in a recital situation. The effectiveness of two therapeutic training procedures were studied: 1. systematic desensitization, relaxation training, and *in vivo* counterconditioning; and 2. music analysis training.

The subjects were thirty volunteer graduate music students who had previously experienced anxiety associated with piano solo performance and had registered experienced performance anxiety on the Personal Report of Confidence as a Performer (PRCP) questionnaire. The PRCP was modified by Appel from a study by Paul (1966) on the modification of anxiety during public speaking. The PRCP was also used in the present study as a pre-test and post test comparison of the level of performance anxiety reported by the subjects in their initial and final performances.

Appel randomly assigned the subjects to one of three training groups, with ten subjects in each group: systematic desensitization training using *in vivo* activities, music analysis training, and a no-contact control group. The

experimenter used one tape recording of relaxation instructions as part of the systematic desensitization procedure. Specific attention was focused on the measurement of physiological scores (pulse rates), introspective scores (PRCP responses), and overt-motor scores (performance errors) as evidence of performance anxiety in pre- and post-tests.

Results showed that solo performance anxiety in adult pianists as measured was found to be modifiable. Both systematic desensitization training and music analysis training with performance rehearsal were found to reduce solo performance anxiety in adult pianists, and both were more effective than no training. The use of systematic desensitization exercises was more effective in reducing solo performance anxiety in adult pianists than was the music analysis training procedure.

A study by Charlotte Sibley Whitaker (1984) was designed to modify stress responses in piano performers. The experimental group was composed of 18 pianists who were divided into two groups, all of whom received the same relaxation training. The relaxation training included three relaxation tapes which were prepared by the author and were used by the participants on a daily basis. The tapes consisted of a combination of techniques including progressive relaxation and autogenic training.

The treatment for subjects was introduced in three training sessions. It was composed of psychological components such as *in vivo* desensitization and cognitive-behavioral techniques. As part of the treatment sessions, the subjects performed a three-minute composition at three recital simulations. Variables used to evaluate stress modification included: 1. the Galvanic Skin Response test, which measured

physiological response; 2. the State portion of the State-Trait Anxiety Inventory, and the Personal Report of Confidence as a Performer (PRCP), which measured subjects' psychological state at a given time; and 3. the Trait portion of the State-Trait Anxiety Inventory, which measured general psychological responses.

Results from the study indicated that performers exposed to a training procedure that contained both muscle relaxation and cognitive-behavioral components showed a significant decrease in Galvanic Skin Response Levels, a significant decrease in levels of state anxiety, and a significant increase in their Personal Report of Confidence as a Performer. They also revealed significantly lower state anxiety levels than performers who had been on a six-week waiting list to receive the treatment. Like Whitaker's study, the present study used both the PRCP and the State-Trait Anxiety Inventory as a pre-test and post test to discern any change in anxiety level over the course of the study.

In vivo desensitization procedures utilize the fear stimulus itself instead of graded imagery. Cooke (1964) found that these procedures produced similar results to desensitization procedures using graded imagery. They have also been found to speed up the positive process of anxiety reduction. Many pianists and teachers suggest frequent repetition of the performing experience before varying types and sizes of audiences as a conditioning procedure to counteract performance anxiety.

Although the technique of "systematic desensitization" was not explicitly addressed in the present study, it should be kept in mind that anxiety reduction may be related to this technique, since progressive relaxation will precede the use of guided imagery. The pairing of relaxation with imagery is used by proponents of systematic desensitization to lessen anxiety while gradually introducing

subjects to anxiety-producing events, such as piano performance. In addition, the weekly performance may be seen as a type of *in vivo* systematic desensitization technique. The settings of these weekly performances are designed in a hierarchical format so that subjects will be performing in front of more people in each subsequent session.

Imagery Research in Sport Psychology

The use of imagery to enhance athletic performance is an increasingly common phenomenon in the field of sports and is a very popular topic in sport psychology literature. Vealey (1986) demonstrated its popularity when she identified four psychological methods which figured prominently in sport psychology books published in North America from 1980 to 1988. Imagery (including mental practice) was discussed in 100% of the books, while physical relaxation, thought control (now called "self-talk"), and goal-setting were each mentioned in 93% of the books.

Imagery research can be divided into five categories that are currently being undertaken by sport psychologists. These include: 1. mental practice studies; 2. pre-competition imagery intervention research using imagery rehearsal prior to performance; 3. studies comparing the psychological characteristics of successful and unsuccessful competitors, often using a questionnaire format; 4. research into variables that mediate the effects of mental practice; and 5. research investigating the effectiveness of stress management techniques on sports performance.

Suinn (2001) states that imagery rehearsal techniques are especially useful for transferring correct responses to competitive or performance conditions. They can also be used to strengthen correct responses and eliminate anxiety or negative thoughts. There are at least five theoretical formulations which have been discussed and studied in an attempt to understand the mechanisms whereby imagery rehearsal enhances motor performance. These five theories include the psychoneuromuscular theory; the symbolic learning or cognitive approach; the attention-arousal theory or preparatory set approach; the bio-informational theory or information-processing approach; and the self-efficacy theory.

The two explanations most often cited to explain the results of imagery rehearsal are the symbolic learning explanation and the psychoneuromuscular explanation. The psychoneuromuscular explanation was initiated with experiments by Edmond Jacobson (1930). It states that during imagined movement, muscular movements occur which are identical to but smaller than the same movements generated during overt movement. Jacobsen's initial research, as well as that by other researchers (Suinn 1976), supports this theory since electromyographic (EMG) muscle activity during imagery appears to mirror the precise motor movements of the task. Because imagery rehearsal duplicates the actual motor pattern being rehearsed, it is thought to be beneficial in the same way as physical practice. This conceptualization is sometimes referred to as the theory of muscle memory, the muscle potential hypothesis, or the neuromuscular feedback theory (Suinn 2001).

The symbolic learning explanation, which states that mental practice facilitates motor performance to the extent that cognitive factors are inherent in the activity, is

supported by studies that find mental practice to have a greater effect on cognitive tasks than on purely motor tasks (Feltz and Landers 1983). This theory hypothesizes that imagery rehearsal gains are more often due to the opportunity to practice the symbolic elements of a motor tasks rather than to muscle activation itself.

Three other theories about imagery are commonly referenced in the literature. Lang (1979a) postulated the bioinformational theory which examines mental imagery in terms of the brain's information processing mechanisms. The attention-arousal set theory (also called the arousal or activation theory) hypothesizes that there is an optimal state of arousal for each athlete that allows him to achieve peak performance, and imagery facilitates an athlete's attempt to set his arousal at an optimal level. It can also help to focus an athlete's attention on the task-relevant cues needed for optimal performance so that he can screen out distractions. The self-efficacy theory suggests that imagery practice heightens an athlete's expectation of success, which in turn enhances motor performance (Janssen and Sheik 1994). Research supporting each of these theories will be explained in more detail in this chapter.

The word "visualization" is often used interchangeably with the term "imagery," but these words do not designate the same thing. "Visualization" refers to imagining the visual aspect of an image. In addition to a "mind's eye," we also have a "mind's ear" and a "mind" to go along with each of the five senses. Most researchers agree that imagery is most effective when it makes use of as many senses as possible: auditory, visual, kinesthetic, olfactory, and gustatory. Thus, pianists should imagine every sense associated with an upcoming performance, including the touch, sight, and sound of the keyboard.

Richardson (1969) divides types of imagery into four groups: after-imagery, imagination imagery, memory imagery, and eidetic imagery. The two groups of imagery which are addressed in sport psychology research are memory imagery and eidetic imagery. After-imagery occurs when the color of a stimulus persists as an after-image with the same relative brightness and color, even after the stimulus has been removed. "Imagination imagery" incorporates such phenomenons as hallucinations, dreams, meditation imagery, and hypnagogic imagery.

Eidetic imagery is a multi-dimensional experience involving all of the sensory modalities, and it is the kind of memory which occurs in what is commonly called "photographic memory." Athletes use eidetic imagery when they describe the motivational state, feelings, or spiritual characteristics associated with competition (Green 1994a). Memory imagery is the most common type and is used to "recall events from the past, the ongoing thought processes of the present, or the anticipatory actions and events of the future" (Green 1994a, 43). Much imagery research has been devoted to the study of memory imagery, which is less vivid than eidetic imagery.

The characteristics of imagery and memory are often intertwined. Guided imagery frequently depends on previously acquired materials as a basis for developing an image. Imagery that is a combination of a stimulus and a previously acquired memory is said to function in an associative way. The guided imagery used in the imagery instructions in the present study (appendix I) relied on musicians' memories of past performances and events. Guided or directed imagery, which was the type used in the current study, combines visualizations in a subject's own mind with a type of guide presented by the researcher which acts as an external stimulus.

Historical Overview of Imagery Research

Historically, the use of imagery is related to the ebb and flow of human reliance on two basic mental processes: verbal thought and visual thought. It appears that the use and development of visualization has taken place in inverse proportion to the evolvement of language and a system of writing for documenting it. It is believed that originally, language was based on images, and words functioned to elicit those images. Words were labels that were used to place objects into categories such as familiar or nonfamiliar (Samuels and Samuels 1980).

Many philosophers, including Aristotle, Pythagoras, John Locke, and Rene Descartes, have stated that inner images are of primary importance in mental processes. Aristotle considered thought to be composed of images, and believed that people who use imagery have the power to motivate, to activate or stimulate a person's emotions, and to reveal inner knowledge. He wrote that "it is impossible even to think without a mental picture" (Paivio 1971, 46).

Well-known scientists including Albert Einstein and the German chemist Friedrich Kekule have stated that visualization is of central importance in their own mental processes. Einstein resolved complex mathematical and physical problems through his ability to interpret inner images. Kekule discovered the molecular structure of benzene while seeing an image of a snake swallowing its tail (Galyean 1983). In addition, the French mathematician Poincare solved mathematical problems during moments of creative visualization (Shipp 1986).

During the first flowering of scientific psychology at the turn of the twentieth century, a great deal of attention was paid to mental images. The "new psychology" of

the 1890s was a science of the mind, and these psychologists used the technique of introspection to describe and explain its inner workings in such areas as perception, memory, imagination, thinking, and emotion. Sir Francis Galton had a special interest in imagery, and while researching it he invented the first questionnaire on imagery and made one of the first statistical surveys related to imagery (Galton 1880).

After the First World War, however, psychologists lost interest in the topic of imagery. As the behaviorist movement took over in the United States, a move away from the use of introspection and toward the systematic study and measurement of behavior took place. The investigation of imagery research was banished from psychology for about fifty years because behaviorist psychologists believed that images and other mental events should not be considered as valid objects of scientific inquiry (Shipp 1986). The belief that the study of behavior should be the sole aim of psychology dominated research from the 1920s to the 1950s.

The study of imagery re-emerged from 1940 to 1965 as developments were made outside of psychology. One area that has contributed to the revived interest in imagery is brain research. As a result of several major developments including electroencephalography, direct stimulation of the brain, and research on the reticular activating system (RAS) of the brain stem, a neurological interest in imagery and visualization occurred (Holt 1964). Researchers in this area have found that structures within the posterior portion of the left hemisphere of the brain appear to be essential in the generation and the experience of imagery. Structures in the right hemisphere appear to be involved in the transformation and the manipulation of mental images (Richardson 1999).

The work of Allan Paivio helped to bring about the re-establishment of imagery as a worthy subject for investigation. His work verified the importance of visualization, particularly as it relates to perception, memory, language and thinking. His work had three main effects: he re-established that visualization was worth studying and pointed out many issues associated with that topic; he suggested methods of research to psychologists; and he presented theories regarding the role of images. According to Hampson and Morris (1983), Paivio's work established the importance of images in two ways: he examined the speed with which individuals can form images in the mind, and he explored the relationship between images, meaning, and comprehension.

In *Doing Sport Psychology*, Jeff Simons (2000) states that imagery techniques may be used for skill development, reinforcement of desired attitudes or philosophical perspectives, and mental preparation for competition or performance. In an initial imagery session with an athlete patient, he contrasted words, or verbal analysis, with symbols, or images. He explained that words are removed from the perception and action that a person experiences because they are symbols which are meant to represent more complex things. Verbal or analytic processing is serial, or requires each bit of information to be taken in sequence. Images allow for the parallel, or simultaneous, processing of huge amounts of information, just like skilled movement.

Simons explains an important theory initially formulated by Paivio, who conceived imagery as being linked to the concrete aspects of a situation. Paivio regarded verbal processes as being more functional in abstract tasks. He argued that imagery is specialized for a parallel processing of information while verbal processes are specialized for sequential processing. Imagery organizes information in a

synchronous way that allows for both flexibility and speed in thinking. The sequential nature of verbal processes, on the other hand, is believed to limit memory content and flexibility. Yet these processes do have the positive function of providing a logical direction to thinking (Paivio 1971).

Self-Reports by Athletes

Sport psychologists became interested in imagery after they discovered how often it was used by the most successful athletes. Questionnaires related to a person's cognitive style and use of imagery were given to athletes at different experience levels so that researchers could develop a psychological profile of a successful performer. Many of the elite athletes stated that they used imagery to prepare for competitions.

In *Golf My Way,* golf champion Jack Nicklaus (1974) wrote about an imagery rehearsal method which he used in which each step of a shot is imagined in reverse order. It consists of first visualizing the ball landing on the green. Next he saw the arc of the ball in flight, and last he visualized his swing and the ball leaving the ground. The final step was to link these together in proper sequence: visualizing the swing, the ball's trajectory, and its landing and bouncing on the green. Nicklaus stated that his shots are 10% swing, 40% setup and stance, and 50% mental picture. This description of imagery use by an athlete is firsthand proof that some elite athletes rely on mental processes like imagery to keep their performances at an optimal level. Descriptions of personal imagery use by elite athletes provided an impetus for sport psychologists to begin researching it as a way to enhance performance.

Tennis player Cris Evert revealed in a radio interview that she rehearsed all upcoming matches in great detail. She centered on anticipating her opponent's strategy and style, and visualized herself countering her own attack (Lazarus 1977). The Olympic high jumper Dwight Stones used a form of pre-jump preparation during which spectators could see his head bobbing in rhythm while he mentally saw himself approaching and clearing the bar (Suinn 2001). Bill Glass, a defensive end for the Cleveland Browns football team in the 1960s, credited his achievement of becoming an All-Pro in part to imagery. He learned to mentally rehearse his moves as if watching them on film. Some of these athletes, like Glass, received training in imagery rehearsal from a consultant, while others seem to have developed the approach on their own (Suinn 2001).

Kirchenbaum and Bale (1980) examined the benefits of a broad-based psychological training program which included relaxation and imagery rehearsal, self-monitoring, and the use of positive self-instruction in a program called Brain Power Golf (BPG). As part of the study, subjects rated the relative merits of each part of the BPG training. The researchers found that imagery rehearsal and self-monitoring were rated highest, with relaxation next, and positive self-instruction lowest.

Imagery Ability

Many sport psychologists believe that some people have higher imagery ability, and will therefore find imagery exercises to be more effective. Good imagery ability has been defined by two characteristics: vividness, which relates to a subject's self-

report of how clearly they see the image, and in how much detail; and controllability, or a subject's ability to manipulate the image. Start and Richardson (1964) examined the role of vividness and controllability in imagery. They found that the group of subjects with the most vivid and controlled images were able to improve their performance the most. The group who improved their performance the least was the group with high vividness and low control, which may actually be detrimental to performance. Uncontrolled images lead the mind and body to rehearse movements and situations that may have negative consequences, and thus it is important for performers to learn how to control their images.

An early study by Clark (1960) demonstrated that not all subjects were able to control their imagery in practicing basketball free throws. In fact, one subject reported that in his imagery rehearsal, his basketball would not bounce but stuck to the floor. Clark's study showed that as subjects reported gains in their ability to visualize and to control their imagery, they experienced gains in both self-confidence and the ability to identify errors in their behaviors.

Considering imagery ability as a factor in the effectiveness of imagery use, Epstein (1980) examined the effects of imagery as a form of mental preparation prior to performance. Each subject was required to complete a questionnaire that involved creating four images and rating each image in the following three areas: the auditory, olfactory, tactile, and kinesthetic sensations evoked through the image; image clarity; and ability to concentrate on the image. When the relationship between the scores on the questionnaire and the accuracy on the performance task of dart throwing was examined, performance for males was positively correlated to auditory, tactile, and

olfactory imagery scores. For females, only a weak positive relationship between skill level and auditory imagery ability was revealed.

Researchers have begun to divide imagery ability into two categories: visual and kinesthetic. Kinesthetic imagery involves mentally experiencing the feelings and sensations of movement, while visual imagery involves mentally seeing oneself performing or seeing the external environment, such as the instrument, stage, or audience that would be part of the actual performance experience. Subjects may be categorized as high or low in either of the two areas, which indicates that they have high controllability and high vividness in relation to either visual or kinesthetic imagery. A study by Goss, Hall, Buckolaz, and Fishburne (1986) examined the relationship between imagery ability as measured by the Movement Imagery Questionnaire (MIQ) and the acquisition, retention, and reacquisition of movements. This study provided support for the MIQ as an instrument proficient in classifying people according to the visual and kinesthetic types of imagery ability.

Ten subjects were selected for the following imagery groups based on their MIQ scores: high visual/high kinesthetic (HH); high visual/low kinesthetic (HL); and low visual/low kinesthetic (LL). People may also be classified as being low visual/high kinesthetic (LH), but interestingly, there were no subjects who were assigned into this group in the Goss, Hall, Buckolaz, and Fishburne (1986) study. The lack of LH subjects was probably a result of the fact that kinesthetic imagery is rarely developed independent of visual imagery.

The subjects learned four movements to a criterion level. Before each trial, they kinesthetically imagined the movement to be produced, and following each trial, they

were provided with visual feedback. There was a significant difference between the three groups, with the HH group acquiring the movements in the least number of trials, and the LL group requiring the greatest number of trials. There was only weak evidence for a relationship between imagery ability and the retention of the movements. High imagery ability therefore may facilitate the acquisition, but probably not the short-term retention, of movements.

Data suggested that it is much more common to be either an HH or LL imager than to fall into one of the combined groups, HL or LH imagers. The majority of the subjects scored as high imagers in both the visual and kinesthetic imagery sections. Imagery ability was found to be related to acquiring certain motor skills. High kinesthetic imagery ability seemed to augment high visual imagery ability and it may be beneficial to skill acquisition.

Ryan and Simons (1982) studied improvement following mental or physical practice in learning to balance on a stabilometer. The subjects also answered a self-report questionnaire concerning the amount and quality of any visual or kinesthetic imagery they had experienced after completion of the learning phase. Subjects reporting strong visual images showed more improvement than those with weak visual images, and those reporting strong kinesthetic images likewise showed more improvement than those with weak kinesthetic images.

In addition to vividness and controllability, a third dimension of imagery is that of orientation. The dimension of orientation refers to whether mental practice is undertaken from the performer's perspective or from the perspective of an external observer (McLean and Richardson 1994). Lane refers to external imagery as

"spectator" imagery and to internal imagery as "involvement" imagery. He states that for imagery to be most effective, the practitioner must feel fully involved in the behavior which he is mentally rehearsing (Lane 1980).

External imagery involves mentally watching oneself perform, as if watching oneself on television. The use of internal imagery requires that during visualization, one is imagining performing as if inside one's own body. Internal imagery has been found to be more effective than external imagery. The "clock test" illustrates the difference between these two perspectives. In this test, an athlete is asked to close his eyes while the face of a clock is traced on the forehead. The clock hands are traced to read 3:00 from the perspective of the external observer. When asked to report the time, the response of "3:00" indicates an external imagery perspective, while a response of "9:00" suggests an internal imagery perspective (Suinn 2001).

The idea that an internal perspective is the most effective is common among sport psychologists, and it has been supported by research on elite athletes and their coaches. Jacobson (1932) and Shaw (1938) were the first to postulate that internal imagery elicits more muscle activity than external imagery (Weinberg 1981). Jacobson's experiments showed that localized muscle activity took place during internal imagery, while only eye activity occurred during external imagery. Hale (1982) similarly found that subjects who employed internal imagery on a weight-lifting task produced more localized muscle activity than those who employed external imagery.

Mahoney and Avener (1977) were the first to categorize images into the internal and external classifications. On a survey of Olympic gymnasts, Mahoney and Avener concluded that successful gymnasts often reported a reliance on internal imagery.

Neisser (1983) showed that the mental practice of dart throwing with an internal orientation resulted in greater accuracy than did mental practice with an external orientation.

A questionnaire was given to 87 elite athletes and 34 coaches of such athletes by Murphy, Jowdy, and Durtschi (1989). A little over half (56%) of the athletes indicated that they used internal imagery as they became more skilled in their sport, while 55% indicated that internal imagery was more effective in helping their performance than external imagery. Additionally, 62% of the coaches believed that the internal imagery perspective was more effective than the external perspective. Of the athletes, a larger percentage agreed that the use of internal imagery made the imagery clearer (50%), enhanced the ability to feel body movements during imagery (62%), and enhanced the ability to become more emotionally involved in the imagery (64%).

The Importance of Positive Imagery

Sport psychologists stress the importance of positive imagery, or the visualization of an ideal performance. In fact, research supports the claim that positive imagery is important in yielding successful results. A significant study on dart-throwing offered the earliest proof that positive mental imagery could influence the outcome of a performance. Powell (1973) compared the results of two kinds of mental practice: positive (MP+) and negative (MP-). Eighteen subjects were matched for initial level of performance and were divided into groups which imagined either good or bad practice in dart throwing. A pre-test revealed that subjects did not differ

significantly in the clarity with which they could imagine fifteen visual, kinesthetic, or auditory items. In five blocks of practice, the subjects alternated between physically throwing darts in blocks 1, 3, and 5 and mentally practicing during blocks 2 and 4. During the mental practice sessions, subjects were told to imagine themselves aiming for the center, with each throw landing either generally near the center (in the case of the MP+ group) or far from it (for the MP- group).

Results showed that positive mental practice was an effective learning procedure leading to improvement, while negative mental practice led to no improvement at all, with even a slight negative trend. The finding that success images improve performance while negative images adversely affect performance was also found by Gould, Weinberg, and Jackson (1980) and Woolfolk, Parrish, and Murphy (1985). It appears that the detrimental effect of negative images is stronger than the advantage brought about by positive images.

Research Supporting the Psychoneuromuscular Theory

The psychoneuromuscular theory holds that imagery rehearsal duplicates the actual motor pattern being rehearsed, but the neuromuscular innervations are of a smaller magnitude during imagery than during physical practice. In the early 20th century, Washburn (1916) wrote on the phenomenon of imagining a movement. He suggested that "tentative movements" or movements of slight magnitude occur during imaging. Assumptions were made that in physical performance, there is some degree of related mental activity, just as in mental practice there are certain neural and muscular

responses. Following these assumptions, Jacobson (1932) and Shaw (1938) also reported that mental rehearsal actually caused minute muscular contractions to occur.

There are various forms of evidence for the premise that imagery rehearsal is accompanied by small but measurable neuromuscular activations consistent with the task imagined (Anderson 1981; Harris and Robinson 1986; Jacobson 1930; Jowdy and Harris 1990; Suinn 1980a). Jacobson (1930) and Suinn (1980a) have observed electromyographic (EMG) muscle activity during imagery which appears to mirror the precise motor movements of the task. Jacobson (1932) thoroughly studied the phenomenon, and reported that his subjects, who were trained to relax using progressive muscular relaxation (PMR), demonstrated action potentials only in the muscles involved in the imagined activity. Muscles in the eyes also contracted, as though the subjects were looking at something. When practicing "inner speech," the muscles in the tongue and lips also contracted as if to say words.

A study by Suinn tested Jacobson's "psychoneuromuscular theory" by training an Olympic skier to use visuo-motor behavior rehearsal (VMBR), which combines relaxation with imagery. The researcher attached electrodes to the legs of the skier and recorded the electromyograph responses as the skier mentally rehearsed each moment of a downhill race. On the EMG, the recorded muscle patterns were remarkably similar to the muscle patterns of a skier who had actually skied the course. "Two muscle bursts appeared as the skier hit jumps. Further muscle bursts duplicated the effort of a rough section of the course, and the needles settled during the easy sections… his EMG recordings almost mirrored the course itself" (Suinn 1980a, 310).

A study by Hale (1982) indicated similar results. Subjects were weightlifters who were instructed with relaxation and imagery to imagine themselves lifting a 25-pound dumbbell. Muscular movement in the dominant biceps brachii muscle was recorded with an EMG measurement. Results indicated significant biceps activity for imagery rehearsal using an internal perspective.

Using subjects who were karate students with different levels of achievement, Harris and Robinson (1986) obtained EMG data from the middle deltoid muscles of each arm. Imagery rehearsal was developed through audiotaped relaxation and imagery instructions. The imagery task required each athlete to perform five right lateral arm raises, holding each for ten seconds. Results indicated that significantly greater increases in the right deltoid muscle were observed during imagery. This finding suggested that muscular innervation during imagery was specific to the muscle normally activated when physically executing the task.

The Harris and Robinson (1986) study also found that advanced skill subjects showed greater localized muscle innervation during imagery than beginners. Interested in replicating this finding, Jowdy and Harris (1990) compared members of a juggling club with volunteers who had no prior experience in juggling. Relaxation and imagery were combined again with instruction given through audiotape. In this study, there were no significant differences across skill levels, but results did confirm significant increases in muscle activity during imagery rehearsal.

Research Supporting the Symbolic Learning Theory

The symbolic learning theory hypothesizes that the learning of performance enhancement which occurs during imagery is related to cognitive learning. An inference that can be made from this theory is that imagery practice would have greater performance enhancement effects with tasks which involve high levels of cognitive requirements. These types of tasks include spatial tasks, tasks involving strategic planning, or sequential learning tasks.

There seems to be greater support in sport psychology research for the symbolic learning theory than for the psychoneuromuscular theory. Greater gains from mental practice have been shown on tasks with cognitive components than on tasks that are purely motor (Ryan and Simons 1981). In their meta-analysis, Feltz and Landers (1983) categorized studies which they reviewed as either cognitive or motor, and they found that although both types of tasks showed large effect sizes, the cognitive tasks effects sizes were somewhat higher. This finding supports the symbolic learning theory rather than the psychoneuromuscular theory, which suggests that mental practice would be more effective for purely physical tasks.

The first proponent of the symbolic learning theory was Sackett (1934), who developed the theory as a way to explain the results of an experiment on subjects recalling the pattern of a maze. Three groups of twenty subjects each learned a high-relief finger maze under the same conditions, and were then given a different set of instructions regarding rehearsal. The groups relearned the maze under similar circumstances after seven days. The three groups included a drawing group, which was told to draw the maze pattern as often as possible during the interval, and was required

to make five drawings immediately after learning and directly before relearning. The second group, the thinking group, was told to think through the pattern during the week but not draw or trace the maze. The third group was requested not to think through, draw, or trace the maze.

Results indicated that symbolic rehearsal in the form of both drawing and thinking is beneficial to the retention of a maze habit after one week, although statistical significance was found only in drawing, which seems to be more effective upon retention than thinking. In the thinking group, 80% of the subjects rehearsed the pattern in visual terms, while 20% used the verbal mode. Because imaginary practice led to greater effects on performance than verbal rehearsal, this study provides evidence for the symbolic learning hypothesis.

In behavioral psychology, symbolic learning might be viewed as analogous to vicarious learning, observational learning, or modeling. Bandura (1969) indicated that new modes of behavior or the modification of existing patterns are often acquired through modeling and vicarious processes. "When a person observes a model's behavior, but otherwise performs no overt responses, he can acquire the modeled responses while they are occurring only in cognitive, representational forms" (p. 133). In testing his theory of observational learning, Bandura has used videotapes as the medium to change motor behaviors.

Since symbolic learning may be viewed as similar to modeling, the use of videotapes may be seen as an indirect test of the symbolic learning theory. By combining imagery rehearsal with videotape modeling, greater effects should be achieved than with the use of imagery alone, according to the symbolic learning theory.

Hall and Erffmeyer (1983) combined visuo-motor behavior rehearsal (VMBR) with videotape modeling, and compared it to imagery practice without modeling. Their subjects were ten female members of a college basketball team who were assigned to either a progressive relaxation and imagery group or a VMBR and videotape modeling group. For the group which included modeling, subjects watched a video of a female basketball player executing ten foul shots with perfect form. They were then asked to close their eyes and imagine themselves completing the "perfect" foul shot. Results indicated a significant improvement in foul shooting percentages of the imagery/modeling group compared to the imagery/no modeling group.

A similar study echoed the results of Hall and Erffmeyer (1983) when Gray (1990) used imagery rehearsal with and without modeling on a group of 24 male students in a beginning racquetball class. He found that imagery rehearsal paired with videotape modeling produced more improvements than imagery rehearsal without modeling.

Research Supporting the Bio-Informational Theory

Lang, a clinical psychologist, has proposed a cognitive, information-processing analysis of imagery and has presented data that partially support his model. According to Lang, an image in the brain is organized precisely, and is composed of a specific set of propositions. These propositions describe stimulus and response characteristics, and imagery involves the activation of a network of these propositions. The propositions are able to access information about behavior prototypes of three types: stimulus,

response, and meaning propositions. Stimulus propositions contain descriptors about stimuli, such as the texture and feel of a basketball. Response propositions relay information regarding behavioral activity. The assertions about behavior include verbal aspects, motor aspects, or physiological aspects, such as the experience of tensing a muscle. Meaning propositions function in an interpretative role to define the significance of events and the consequences of action. A meaning proposition could be: "I get nervous before performing and my heart starts pounding" (Suinn 2001).

Vivid images allow for stimulus and response propositions to be processed. For instance, in relating imagery rehearsal to musical performance, activating the stimulus propositions might include the lights dimming, the audience clapping, and the sound of the music. Response propositions for a pianist would include raising the arms, feeling the keys under the fingers, and any muscular changes involved in playing the first few measures of music.

The bio-informational theory postulates that in order for imagery rehearsal to influence athletic performance, response propositions must be activated along with the stimulus propositions. These response propositions represent the prototype that will influence overt behavior. Once the response prototype is activated, then it can be subject to revision, leading to improvements in overt performance. This theory is supported by the finding that experienced athletes benefit more from imagery than do novices. The theory hypothesizes that when a network of propositions is processed, such as in perception or imagery, measurable physiological responses occur.

A main part of the bio-informational theory is that the effectiveness of imagery is determined by response propositions, or how the individual reacts to stimuli during

imagery. Lang has offered much evidence for his theory by working from research on emotions such as anxiety and fear. In his studies, psychophysiological anxiety responses are found when the appropriate stimulus or response propositions are evoked, as predicted by the theory (Lang, Levin, Miller, and Kozak 1983; Lang, Kozak, Miller, Levin, and McLean 1980). He has shown that fear scenes result in concurrent increases in heart rate and respiration, while action scenes, such as sport imagery, are accompanied by enhanced muscular activity (Lang 1979b). A corollary to these findings indicates that the way in which an individual physiologically responds is mediated by that individual's past experiences. For example, a veteran performer might react more strongly to images of performance anxiety because of extensive experience in that type of situation.

By manipulating stimulus and response propositions in different kinds of imagery scripts, Lang and his colleagues have demonstrated that vividness is determined by the completeness of the evoked propositional structure, or the directions for imagery content. In addition, these researchers have also shown that it is possible to enhance vividness ratings by using a training program that systematically reinforces the client's statements of response propositions (Lang, Kozak, Miller, Levin, and McLean 1980).

The theory implies that imagery will be more effective if individuals physically attempt a skill first in order to develop kinesthetic awareness and the inclusion of response propositions in motor imagery. It would be necessary to adopt an internal perspective in order to include response propositions in imagery scripts. Evidence that the internal perspective is more effective, such as that found by Jacobson (1932), Shaw

(1938), and Hale (1982) supports the bioinformational theory. The internal perspective appears to induce more clear stimulus propositions as well as greater response propositions, resulting in improved performance (Suinn 2001). Visual and kinesthetic aids also would improve vividness and control. Videotapes or other visual aids such as slow-motion playback and kinesthetic awareness exercises can help to improve the reality of the image content (Hale 1994).

Self-Efficacy Theory

Cognitive-behavioral therapists have long believed that imagery can positively affect self-confidence. They have therefore developed imaginal strategies such as systematic desensitization and coping imagery to encourage behavior change. The self-efficacy theory of human behavior change argues that many psychological interventions achieve their effects by modifying an individual's self-efficacy level (Bandura 1977). These modifications can be achieved through both actual experience and through vicarious or even imagined experience. Modeling is a well-established treatment intervention based on this theory.

Self-reports from athletes who regularly utilize visualization techniques indicate that confidence changes often accompany imagery rehearsal (Budney, Murphy, and Woolfolk 1994). However, this area needs to be further researched before any definite conclusions can be made about the role of imagery in enhancing self-efficacy.

Research Supporting the Attention-Arousal Set Theory

The attention-arousal set theory proposes that imagery establishes a level of arousal that is optimal for performance. Schmidt (1982) states that the "performer is merely preparing for the action, setting the arousal level, and generally getting prepared for good performance" (p. 520). Some researchers believe that the level of arousal has an influence on a performer's attention. According to this view, imagery rehearsal focuses attention on task-relevant thoughts, and away from distracting thoughts.

This approach often relies on emotive imagery, since prior research suggests that imagery content can bring about emotional elements such as feelings of competence and success. These emotions are designed to lead to arousal and divert attention away from irrelevant thoughts. Murphy, Woolfolk, and Budney (1988) instructed their subjects to develop imagery that evoked emotions, and presumably arousal. Three types of imagery content were used: anger and fear as emotional content, and relaxation as nonemotional content. Subjects were 24 male volunteers whose motor task involved a hand grip dynamometer which they were told to squeeze as hard as they could upon feeling "highly involved" after visualizing the images (p. 337).

The hypothesis, which proposes that preparatory arousal in imagery content would increase strength performance, was not supported by the results. Although the imagery did lead to increases in emotional arousal, neither anger nor fear conditions led to an increase in strength performance above that achieved in the pretest. Interestingly, 75% of the subjects believed that their best performance was associated with anger arousal, but this was only true for 28% of the subjects. The Murphy, Woolfolk, and Budney (1988) study seems to fail to support the interpretation that imagery rehearsal

works best through the mechanism of arousal or activation, since the introduction of arousal in imagery content failed to help performance. However, further research is needed to find whether there were any weaknesses in the above study and convey more information about the role of arousal in imagery and its influence on attention.

Imagery Research in Music

Research studies in music have so far investigated the use of imagery only as a way to alleviate anxiety. Research concerning its other benefits such as raising confidence level and strengthening memory and concentration have not been reported in the literature. Many musicians have, however, already begun to transfer some of the findings from sport psychology into their own art by utilizing imagery in their teaching and their own preparation for performance. Several articles explain how to use imagery and mental practice to support practice that is done at one's instrument.

Schmitz (1935) was an early advocate of mental practice who claimed that aural perceptions of the printed score are best achieved away from the keyboard. He believed that mental practice should be used when students become too distracted with technical problems and begin to concentrate less on musicality.

Another early book that promoted the use of mental practice and imagery in piano playing was titled *New Pathways to Piano Technique* (Bonpensiere 1953). Bonpensiere advocated an approach to the piano which he referred to as "Ideo-Kinetics." He stated that "we find that the reading of a musical sequence away from the

piano is far more effective than actually trying it with our hands on the keyboard" (p. 9). The reason for this according to Bonpensiere is that during physical playing, our thoughts interfere and prevent us from letting our hands do what they know how to do in the absence of conscious will. "During the holding of a mental image. . .," he stated, "the volitional activity of intruding thoughts is deviated from our consciousness" (p. 10). Pianists can overcome fear and tension, he believed, by mentally singing while they play, so that extraneous thoughts cannot interfere. Additionally, the hands will automatically follow what the mind is singing, even with the eyes closed.

The author advocated the use of symbols in learning music, and it is in this sense that he was an early proponent of imagery. He stated that pianists should use both "systematic" symbols, which already exist as musical notation, and "arbitrary" symbols, such as the designation of a numeral for a specific pattern or chord. These symbols are used to integrate musical patterns. Once a passage has been designated with a number or other symbol, the pianist should close his eyes, vividly see the mental image of the symbol, and play the passage with the hand entirely relaxed.

Another part of Bonpensiere's philosophy is that musicians should be concerned with the results themselves, rather than the means to achieve them. Bonpensiere suggested that musicians should know what the hands will do, but not help them do anything. "When you sincerely do not care whether they hit wrongly. . . you save yourself, automatically, from the danger of doing wrong hitting."

Bonpensiere stated that pianists should never play for the sake of getting the correct notes, but should always aim for an ideal interpretation. If the sound is not

ideal, “take your hands off the keyboard and retouch it mentally with the carving and painting and repolishing tools of your mind until you are satisfied” (p. 70).

Another early instructional manual which advocated the use of mental practice was called *The Twelve Lesson Course: A New Approach to Violin Playing* (Havas 1973). In describing a type of hand motion he called “tossing” that should be learned by beginning violin students, Havas recommended that “If it proves difficult the best possible thing is to put the violin down and simply think about the movement. And when this process of tossing is quite clear in the mind, try again.” Students should, therefore, learn movement patterns by alternating between trying them and thinking about them. Elaborating on this idea, Havas wrote:

> Much struggle and useless work could be avoided if the silent “thinking” practice were more developed. For no physical action can take place without an order from the mind. This is why mental discipline plays such a tremendously important role in good violin playing; for if the mind is disciplined to give orders only to those basic points which are the key positions of the fundamental balances, these fundamental balances in turn will have the power to motivate a chain of other actions as well. The brain is rather like a puppet master manipulating his puppet theater (p. 5).

Malva Susanne Freymuth (1999) advocated similar ideas in a book titled *Mental Practice and Imagery for Musicians*. She defines mental practice in music as one of two processes: mental recall and mental projection. According to Freymuth, daily practice sessions should consist of a three-step practice loop: ideal projection, action, and mental recall. Regularly alternating between mental and physical practice is recommended.

The guide to training in mental practice consists of developing a mental awareness of the five senses. According to Freymuth, musicians should develop aural awareness by first memorizing A-440, and then learning to imagine intervals, melodies, and rhythms. Kinesthetic awareness includes a “whole-body scan” in which one scans

the body for tension, imagines movements, and then imagines playing the instrument. Freymuth also wrote that when watching or listening to a model performance, musicians should "empathize" with the performer to gain insight into how it might feel to play with the same sense of ease and security. This type of vicarious learning experience is similar to what sport psychologists refer to as modeling. Appendices to the book include a section on teaching mental practice techniques to young students, guided relaxation scripts, and ways of using imagery to support the healing and rehabilitation of injuries. In discussing ways to achieve relaxation, Freymuth promotes meditation, autogenic training, and biofeedback.

Susan Bruckner (1998) advises musicians to increase the visual representational system in learning and performing by using imagery. She discusses three visual perspectives which she refers to as the first, second, and third positions that can be used when doing imagery rehearsal. She suggests that students use the first position to engage the visual, aural, and kinesthetic senses by imagining being on stage and going through the motions of performing. The second position enables students to detach from the emotionally charged perspective of first position by mentally becoming a member of the audience and watching a satisfying and expressive performance. In the third position, students imagine being at the back of a hall, watching the performance played with confidence and accuracy. This perspective stresses an awareness of the audience connecting to the beauty of the music. Bruckner claims that the third position is perhaps the most creative position, because it increases the neutrality of one's vision and enables students to see the situation from different perspectives.

A dissertation by John Arthur Shipp (1986) examined meditation and visualization techniques as used by musicians. He searched for evidence supporting the contentions that musicians use meditation and visualization, and sought to find out what procedures were used as well as their purported benefits. The first part of his dissertation consisted of a comprehensive review of the literature on meditation and visualization. The literature review found evidence of the use of these techniques across several cultures from prehistoric to modern times, by both musicians and non-musicians. In this part of the study, the researcher found evidence that some composers, conductors, music teachers, and performers utilize meditation and visualization techniques.

The second part of the dissertation was an ethnographic study that consisted of three case study interviews of musicians who use meditation and visualization. The three subjects all used some similar meditative and visualization procedures including body relaxation techniques and deep breathing exercises. The subjects emphasized the physiological and psychological changes that occurred during these procedures and discussed several of their perceived benefits. These participants referred to the visualization process as "thinking in pictures" and believed that all musicians visualize, whether they are aware of it or not. Benefits of visualization, according to the informants, included the improvement of health, the ability to perform better, the achievement of career goals, and the development of better teaching skills.

All three subjects stressed the importance of mental concentration, or focusing, during visualization. One informant referred to normal thinking as "cluttered thinking" because of the lack of concentration on a single object or subject. He explained that

distractions through the physical senses of seeing, hearing, touching, smelling, and tasting prevented people from focusing on a single subject for any length of time. The informants said that they concentrate their mental attention on the various parts of their bodies as a relaxation technique. They all stressed the importance of relaxing the body in meditative and visualization procedures.

A study was conducted by Laroy Horace Borchert (1991) as a beginning step for developing a systematic approach to studying mental imagery in relation to musical performance. Three types of differing instructional groups were used: a group of subjects who were given a verbal instructional guide, a verbal mental image guide, or a control group which relied on physical practice only. The verbal instructional guide gave subjects precise directions on what to notice in the music and how to practice it. The imagery instructional guide utilized metaphors and images such as a wave crashing or a baby sleeping to demonstrate interpretative results to work for during practice. Borchert's study differs from the present study because the images were related to musical content rather than the performers' self-image.

The subjects were given both a pre-test and post test which consisted of the performance of a melody that they had not seen before. They were given three minutes to look at and/or practice the melody. Three professional musicians judged each performance of the melody according to four categories of mistakes: correct notes and articulations, tempo, dynamics, and phrasing. All three groups showed improvement from pre-test to post-test, with the groups differing statistically in only one category. There was a marginal significant difference between the verbal instruction group and image group in the accuracy of notes and articulations. The imagery group showed the

most improvement overall and scored the least amount of mistakes after instructions. However, there was evidence from a post-hoc survey showing that a high percentage of the subjects in the non-imagery categories still experienced some type of mental imagery over the course of the study.

The Use of Imagery by Musical Pedagogues

In an article on cognitive strategies and skills for pianists, Phyllis Alpert Lehrer (2002) suggested that teachers begin to use visualization during lessons to help students become aware of every sound that they make on the piano. She stated that pianists can practice visualizing the precise fingerings and arm and hand movements that they use at the keyboard. According to Lehrer, students should also practice imagining visual cues such as the keyboard topography associated with these movements, and the musical form as it appears on the page.

There is only a small amount of evidence of imagery being taught to musicians for the purpose of developing musicianship. As part of his case study, Shipp (1986) described how one of his subjects taught a music theory course which incorporated visualization and imagery techniques. Titled "Sound-Images," the course taught students how to improvise harmony, melodies, rhythm, meter, and tempo in seven one-hour sessions. For every concept, the subject gave his students a visual image to match. For example, each tone of the scale was represented as a neighbor in a neighborhood. The subject referred to this as a simplification process, in which an image helped his students to recall the

concepts more easily and later assimilate them into a larger structure, like harmony.

William Lincer was a professor of viola and chamber music at the Juilliard School of Music who incorporated relaxation and visualization exercises into his viola teaching. He used an eight-part program of studies which included the following pairs of exercises: breathing and relaxation studies to gain presence of mind and self-assurance; body-movement and muscle-action studies for physical relaxation and efficiency of motion; feeling and awareness studies to relate emotion to music; and concentration and visualization studies for mental focus and a solid memory. He believed that "the more intellectual we are about actually performing music, the farther we can get from our most intimate feelings. . . our playing can then become a constant struggle of 'thinking against doing'" (Kella 1982, 38).

Breathing exercises were used to slow down the student's basic body and mind rhythms to a pace closer to that of a non-competitive mental state. Using a relaxation technique similar to progressive relaxation, students tensed and relaxed the major muscle groups in sequential order. A progressive mental relaxation exercise was then used to relax the mind and body to a deeper restful state.

During this meditative state, Lincer applied what he referred to as "affirmation learning." These techniques required the student to quietly repeat or listen to brief, personally appropriate phrases designed by Lincer to lessen insecurities about particular technical issues or performance situations. Lincer believed that this stress-free, noncompetitive environment allows students to be at their most imaginative and

expressive. He also stated that it assists the students in developing concentration and self-confidence.

Lincer's ideas came partly from a book by L.E. Sweigard titled *Human Movement Potential* (1974) which advocates the use of mental imagery to teach body movement. If the mind conceives of an "imagined movement" that is consistent with the natural mechanical function of the body, the body will follow and find its own efficient neuromuscular coordination to perform that movement. Lincer used images to assist in maintaining posture, movement efficiency, and general structural and physical well-being.

Lincer introduced visualization with the visual memory of the printed page. The student began by mentally "projecting" words onto the studio wall, using eidetic imagery. Lincer then had them progress to longer words of two, three, and four syllables. Once these words were mastered, the student began visualizing musical phrases which became more and more complex. The student eventually practiced visualizing sections, then entire movements, as if seeing them clearly on a printed page.

The student then incorporated the other senses so that sound and touch were imagined along with the score. Lincer stated that he found much improvement in concentration span and mental focus in performance if it was preceded by the "visualization" of the entire musical composition. In the final synthesis that takes place in performance, the visual, aural, and physical senses are all used to depict the "emotional nuance that the musical phrase suggests in sound" (Kella 1982, 67).

The Use of Imagery to Alleviate Performance Anxiety

Kim (2003) examined the effects of two music therapy techniques on ameliorating performance anxiety among student pianists. The two techniques used were improvisation-assisted desensitization and music-assisted progressive muscle relaxation (PMR). In music-assisted PMR work, the progressive relaxation sessions are accompanied by music playing in the background to further relaxation. Thirty female college pianists were randomly assigned to one of the two conditions and were given six weekly music therapy sessions according to their assigned group. Two lab performances were conducted, one before and one after each of the six sessions. Pre-test and post test measures were completed, including self-report, the state anxiety scale of the State-Trait Anxiety Inventory (STAI), and the Music Performance Anxiety Questionnaire (MPAQ). Participants' finger temperatures were also measured to assess changes in anxiety level.

Results from the study indicated that the music-assisted PMR and imagery treatment was very successful in reducing musical performance anxiety. Statistically significant differences occurred in six out of the seven measures, including the STAI, MPAQ, and finger temperature. The author stated that all subjects easily followed the PMR and imagery procedure from its first presentation, and their physical tension and anxiety levels were readily reduced. The improvisation-assisted desensitization treatment was effective in managing performance anxiety, although the music-assisted PMR and imagery condition resulted in greater mean differences from pre-test to post-test.

Subjects from the study also commented that aspects of the PMR and imagery technique were effective in situations other than performance-related events. Many subjects reported the success of using rhythmic breathing and music-paired imagery for stress reduction prior to events such as a driver's license test, a class presentation, and a job interview (Kim 2003).

Mary Grace Galvan (1992) surveyed the possible effectiveness of kinesthetic imagery and mental practice on the keyboard skills of the piano principal. She investigated research by sport psychologists and movement artists, asserting that mental practice may be used by pianists to "consciously translate printed notes into kinesthetic sensations that produce spontaneous physical responses" (p. i).

Galvan recommended that mental practice techniques such as centering and relaxation procedures be used prior to imagery. Also included in her document were hypothetical profiles used to describe characteristics of piano principals likely to be found at the college or university level. Galvan prescribed specific mental exercises that could be used to counteract each profile's weaknesses. These weaknesses were related either to reading ability, anxiety, or technique.

Imagery Use by Elite Musicians

Other testaments to the usefulness of imagery include accounts by elite performing musicians. The pianist Jorge Bolet stated that "I like to practice for a time at the keyboard, then go away from it for a spell because now I have all that music spinning around in my head and I want to play it mentally." He also stated that "I have

never solved a major mechanical or interpretative problem at the keyboard. I have always solved it in my mind" (Mach 1988, 29).

Glenn Gould's use of kinesthetic imagery in his practice routine was recounted by Otto Friedrich (1989) in a biography of the famous pianist. Gould used mental practice to rehearse a Beethoven concerto because he was disappointed by the instrument that would be used for an upcoming performance. After visualizing an ideal environment in which he played his favorite piano, Gould used external imagery to mentally observe his playing, but refrained from physical movement during the mental practice (Friedrich 1989).

Perhaps the most remarkable story illustrating the benefits of mental practice is that of a nineteen-year-old Chinese pianist named Liu Shih-kum, who won second place in the International Tchaikovsky Competition. Shih-kum was an established concert pianist in China during the cultural revolution of the 1960s. When Western music was denounced by Mao Tse-Tung, he refused to denounce the music and was thrown into jail for six years. After he was released from jail, he was asked to perform in Beijing with the Philadelphia Orchestra. Although he had not touched a piano in six years, his performance was well-received because he had been recreating the music in his mind all along (Korn 1994).

Practical Applications of Imagery

The main benefits of using imagery include skill acquisition, skill maintenance, and the planning of performance. In addition, sport psychologists state that imagery can be used to manage stress, increase concentration, enhance self-efficacy, and regulate anxiety (Budney, Murphy, and Woolfolk 1994). Researchers are also interested in its effects on problem solving, memory, aural awareness, education, medicine, and muscular efficiency. The literature in these areas will be reviewed as evidence for the effectiveness of imagery use and to provide a background of how imagery has been used.

Regulation of Arousal

The term "arousal" may be used as a substitute for the term "anxiety," which is a commonly used term denoting the anticipation and excitement leading up to a performance. Since the term "anxiety" has a negative connotation, it may not be the most appropriate term to use with a student who may already have worries or fears about upcoming performances. Although the term "anxiety" is often associated with only negative side effects, it has been recognized by some researchers that performance anxiety has both positive and negative components.

Previous research has indicated that a certain amount of performance anxiety actually enhances the quality of performance (Hamann 1982). Likewise, many musicians believe that some anxiety is necessary to enhance the quality of performance

(Hinder, Brandt, Katz, French, and Beckiewicz 1987). Research by Wolfe (1989) suggested that performance anxiety consists of both positive and negative components. Arousal and confidence may arise from anxiety in some performers, while negative components such as nervousness and self-consciousness may be present in others. However, Salmon (1990) argued that the anxiety which most musicians want for optimal performance is in reality not positive anxiety but a heightened state of arousal.

In a pedagogical article titled "Stage Fright: Coping Methods and Formal Treatments," Gabbard (1981) listed nine techniques used by performers to help them deal with performance anxiety. Of these nine techniques, four are directly related to imagery, mental practice, and relaxation. "Physical relaxation and breathing exercises" may be used to help performers who lose control of voluntary muscles while performing, such as a pianist cited by Gabbard whose knees shook so badly that he was unable to operate the pedals. Systematic relaxation of all muscle groups in the body, according to Gabbard, helped this pianist overcome his problem. This technique is similar to progressive relaxation. The author also names deep breathing exercises as another antidote to stage fright.

Gabbard uses the following recommendation prior to performance:

> Seat yourself comfortably in a chair, close your eyes, and take deep breaths. Alternately tense, then relax, each major muscle group beginning with the feet and working up to the head. When this relaxed state is achieved, stand up and take five deep breaths, paying particular attention to the use of the diaphragm so as to avoid shallow breathing or hyperventilation (Gabbard 1981, 16).

Gabbard also states that with the help of guided imagery, "self-programming" can help a person program himself to succeed in situations where he has previously had difficulties.

> A week or two before the performance, the performer spends a few minutes twice a day to visualize the performance in just the way he would like it to be. An

> example might be as follows: after sitting comfortably and relaxing each body part until there is no trace of tension in the body, the performer imagines himself dressing for the performance, filled with optimism and delight at the prospect of his smashing success… he visualizes the performance and associates mental images with every passage of the music. He sees himself becoming completely absorbed in the beauty of the piece and is met with thunderous applause at the completion of the concert. If the performer repeats this exercise twice daily for the days or weeks preceding the performance, he will have programmed a scenario that becomes a self-fulfilling prophecy on the evening of the performance. Furthermore, the actual performance is now associated with a relaxed mental and physical state rather than with a state of tension and anxiety (Gabbard 1981, 18).

Some musicians have a specific area of their body that gets tense during performance. For instance, Gabbard mentioned a trumpet player whose jaw quivered when he began to warm up for a performance. In these cases, attention should be placed on the body rather than on the music that is being played. By sitting comfortably and relaxing his body, and then imagining the nervous energy being transferred from his jaw down to his toes, the performer learned to relax his jaw before a performance and overcome his anxiety.

"Absorption in the performance" is a third technique related to the present study because it requires the kind of concentration that is built when musicians have spent time using imagery and mental practice. As Gabbard states, "mental imagery associated with each passage, in rehearsal and in visualization. . . is a particularly helpful method of maintaining one's absorption in his performance." Being caught up in the performance, so that the performer's attention is on the music she is playing rather than on herself or the audience, is perhaps the best way to overcome stage fright.

Stress management programs, which are referred to as "multimodal stress management packages" in the literature, aim at alleviating both cognitive and somatic anxiety and have been applied in sport. Two such packages include stress inoculation training (Meichenbaum 1975) and cognitive affective stress

management, which both combine training in relaxation with skills in imagery and positive self-talk. A third package combining imagery with physical relaxation is VMBR (Suinn 1972b), which will be used in the present study and was discussed in this chapter in the section on "Relaxation Techniques."

Memory

Little imagery research on memory of motor movement exists in the field of sport psychology. Similarly, this research is lacking in the field of music as it relates to auditory, visual, or kinesthetic memory. There has, however, been a great deal of research in the field of cognitive psychology related to the effect of imagery on memory of verbal, spatial, and mathematical tasks. Research findings in this area will be cited so that musicians can perhaps transfer some of the results to their own field.

Most of the current research on the relationship between mental imagery and memory deals with verbal memory. The spontaneous use of imagery in verbal-learning tasks appears to be relatively high, according to questionnaires on people's habitual ways of thinking as well as reports of the verbal mediators used in particular learning tasks. An example of a mediator is a connecting device used to memorize a pair of words. The use of imagery in verbal learning tasks is associated with relatively high levels of performance (Richardson 1999).

Paivio (1971) presented the most fully developed and strongly supported model of imagery which he called the "dual coding model." The model hypothesized two major modes of coding experience: imaginal and verbal. It assumes that memory for any event

is enhanced to the extent that the individual uses "dual coding," or uses both imaginal and verbal systems to code the event. Pictures are better recalled than concrete nouns, while concrete nouns in turn are retained more easily than abstract nouns. According to Paivio's theory, pictures are most likely to elicit both verbal and imaginal codes, while abstract words result only in verbal coding.

Verbal coding is thought to be superior if the order of information is critical, while imagery is preferred when the integration of information is most important. Paivio believed that verbal coding ability develops later than imagery ability. An additional component of this theory is that the verbal system is supposed to be specialized for serial or sequential processing, while the image system is supposed to be specialized for parallel or simultaneous processing like that used during the performance of a learned movement pattern (Paivio 1971).

Another model regarding imagery in children's learning is a hypothesis by Rohwer and Bean (1973) which states that children learn pairs of words best when a connector between the two words elaborates some relationship between them. They suggest that in a similar way, any pictorial representation will improve recall if it elaborates the relationship between the items to be associated.

One study assigned sixth-grade subjects to four different conditions in memorizing sentences. Two conditions required repetition; one was a control; and one encouraged subjects to use imagery to assist in memorizing the sentences. Imagery instructions facilitated memory, while repetition did not. In fact, overt repetition interfered with memory (Levin, Guttmann, and McCabe 1977).

Similarly, Purkel and Bornstein (1980) reported that seven- and eight-year-olds' memories of prose were equally enhanced by pictures accompanying sentences and imagery instructions. Both immediate recall of sentence objects and their recall after one day were improved. Imagery was shown to be an effective prose memory aid for older children.

Concentration

Concentration is the act of focusing one's attention, and it is one of the most important elements in musical performance. It is critical for neuromuscular coordination, and affects a performer's awareness of quality of sound and the ability to receive and process body feedback. The highest level of concentration is reached when someone is so absorbed in one area that they lose awareness of other things going on around them. Timothy Galley (1974) referred to this level as a state of "relaxed concentration." This state does not mean trying hard to concentrate, but being fascinated with the object of one's attention and maintaining a childlike state of self-forgetfulness.

Concentration can be enhanced with relaxation and imagery (Korn 1994). In an article on the use of VMBR to improve athletic performance, John F. Lane states that the "ability to concentrate is probably the single most important benefit which I think athletes derive from VMBR training" (Lane 1980, 318).

Don Greene (2002) listed concentration and attention as two of the "seven essential skills for optimal performance" in addition to determination, poise,

mental outlook, emotional approach, and resilience. He listed four categories involved in quality of attention: the object of focus, focusing past distractions, mental quiet, and mental boundaries. The object of focus relates to what you tend to focus on while performing, and your level of concern with what others may think about the performance. Focusing past distractions entails the ability to know how to direct one's attention past external events. Mental quiet is the ability to pay attention to the complex skills one is performing without being distracted by internal thoughts. Musicians must also be able to construct mental boundaries, in which they are able to judge whether items that come into mental focus are relevant or irrelevant to the task at hand.

The "attention-arousal set theory" proposes that imagery establishes an optimal "attention set" for task performance. A major component of this theory is the idea that mental rehearsal strengthens the attentional processes of performers. Although less direct research has been done on the relationship between concentration and mental practice, some of the research that supports the "attention-arousal set theory" can be seen as support for the idea that mental practice helps athletes to improve concentration. In this chapter, this research is covered under "Imagery Research in Sport Psychology" in the section on support for the attention-arousal set theory.

A standard research finding is that expert athletes tend to benefit more from imagery than novices. Moran (1991) argues that if mental practice is beneficial because it strengthens the schema of a skill, then expert athletes would benefit little from mental practice. Instead, mental practice may serve an

attentional function by improving concentration and reducing skill-disruptive levels of arousal.

Robert M. Nideffer (1976) believes that it is "hard to imagine a variable more central to performance than the ability to direct and control one's attention" (p. 395). He states that attention can be conceptualized on at least two dimensions: breadth of focus and direction. Attention can vary from being quite narrowly focused, and filtering out a great deal of information, to being very broad. Performers can also attend to external stimuli (environmental events or surroundings) or internal stimuli (thoughts and feelings). Most people maintain a balance between these two directions, and shift from one to the other. The following is an example of how these types of attention are used in the musical profession: practicing a solo piece calls for a narrow internal focus, while conducting a choir demands a broad external focus.

At the University of Rochester, Nideffer and his associates have developed a questionnaire called the Test of Attentional and Interpersonal Style (TAIS) for athletes to assess their attentional strengths and weaknesses. Six of the 17 categories in which athletes are placed are listed below, with a high number in each category indicating that an individual:

BET (Broad-External): deals effectively with a large number of external stimuli

OET (External Overload): makes mistakes because he is overloaded and distracted by external stimuli; has difficulty narrowing attention when necessary

BIT (Broad-Internal): is able to think about several things at once when a situation calls for it

OIT (Internal Overload): makes mistakes because he thinks about too many things at once. "He is interfered with by his own thoughts and feelings" (p. 283).

NAR (Narrow Effective Focus): is able to narrow attention effectively when it is appropriate to do so

RED (Errors of Underinclusion): has chronically narrowed attention, and makes mistakes because he cannot broaden his attention when necessary.

In his article on "Attentional Focus—Self-Assessment," Nideffer (1980) describes various profiles of athletes and the ways in which sport psychologists can help them overcome their attentional weaknesses. Like athletes, musicians must be able to both narrow and broaden their attention according to the situation at hand. Ensemble musicians and accompanists must have the ability to concentrate on their music while attending to the cues of their fellow musicians and listening carefully to the entire ensemble.

Solo performers must be able to narrow their attention effectively. Broadening their attention to the audience or what is happening around them may actually be detrimental. Musicians do, however, need to be able to think about several things at once, such as listening to what is being played, paying attention to body movement, and cueing themselves for memory. Therefore, since this particular study pertains to solo performance, only Nideffer's profiles of athletes

who need to improve their Narrow Effective Focus (NAR) or Broad-Internal Focus (BIT) will be explored.

Athletes who have an "ineffective attentional profile" with a low BET, BIT and NAR can improve their performance by learning to narrow their attention, as well as how to shift the direction of their focus. In addition to meditation, Nideffer recommends the mental rehearsal of performance to teach these athletes to distinguish between the relevant cues and the irrelevant ones.

Athletes with a "choking" profile with a low BIT and BET and a high NAR have a narrowed attentional focus and a tendency to "choke" or make mistakes in complex, rapidly changing situations. They fail to react quickly enough to changes, such as a pianist who has trouble adjusting to the action of a new piano in a competition. Nideffer states that there are two procedures which can help these individuals learn to broaden their attention: relaxation and mental rehearsal. Arousal may be used to narrow attentional focus, while relaxation broadens it. Therefore, progressive relaxation may be used to help these performers by broadening their attentional focus. Mental rehearsal procedures are beneficial because they can teach a performer to make more effective use of her narrowed focus. Learning to rapidly shift and direct a narrowed attentional focus to many different cues will help to simulate a broad focus.

Athletes with an "external distractibility profile" or a low BIT and NAR and a high BET and OET tend to be reactive rather than reflective. In other words, these individuals respond almost instinctively to changes in the

environment, but fail to learn from incorrect responses. Mental rehearsal techniques may help these individuals to develop a more reflective learning style.

Athletes with a high anxiety profile score low on the BIT and NAR scales and high on the OIT and RED scales. They are likely to become so upset by mistakes that they think about little else, and focus internally during the performance rather than paying attention to what is happening in the moment. This overly internalized focus will lead to an ever-increasing number of errors. According to Nideffer, these individuals probably suffer from high levels of both state and trait anxiety. Relaxation techniques like progressive relaxation can be helpful in reducing the level of arousal and modifying their attentional processes.

Aural Awareness and "Audiation"

Most musicians agree on the importance of auditory imagery in the development of musicianship, although there has been only a small amount of research in this area. A questionnaire given to 200 members of the Music Teachers National Association was developed by Agnew (1922b) to find out more information about auditory imagery. One question asked how clearly the subjects could hear the first phrase of the song "America" as played on the piano. More than half of the musicians gave themselves the highest grade, indicating that it was "as clear as the actual hearing" (p. 273).

The questionnaire itself consisted of six questions regarding the subjects' own abilities and beliefs about auditory imagery. On the first question, "Do you

naturally recall music vividly in realistic auditory imagery?", the musicians replied almost unanimously in the affirmative. Of the 38 people who gave answers to the second question, "Do your compositions always come naturally to you in realistic auditory imagery?", 31 answered yes. A third question asked "Has your own auditory imagery developed or tended to regress as you have matured?" To this question, 59 of the 62 people who responded said that it had developed. They described the reason for this development as constant practice or training in music. A fourth question asked if there were differences in imagery of individual students, and there was almost unanimous assent that the difference was great. The last question asked what significance the teachers attached to such differences, and several individual answers to this question are quite informative in regard to opinions about the importance of auditory imagery. They include the following quotes:

> "Vivid auditory imagery would seem to mark the musically sensitive."
> "I believe a clear auditory imagery is the real basis of musicianship."
> "I aim at the auditory image from the start. Those having clearest imagery perform most artistically and only as they gain this ability, is music of real cultural value."
> "Those who are strong on imagery memorize easily."
> "The matter of tonal imagery is a vital one in musical training and education. Together with the ability to hear tones and sense rhythms through the eye while looking at symbols, this power of mental hearing is fundamental and absolutely vital in music education, not only for the singer, the player, and the composer, but for the intelligent listener as well."
> "I consider the development of this faculty a highly important function of musical education which has been woefully neglected thus far. . . But it is of inestimable value both to the composer and interpreter."
> "You have found probably the weakest spot in present-day musical training . . . the training should begin early, and continue throughout the entire course. The results would be manifold: 1. more composers and better; 2. better interpreters; 3. more intelligent listeners, whose enjoyment of music would not only be heightened, but prolonged." (p. 273)
>
> In *The Psychology of Musical Talent*, Carl Seashore (1938)

described musical talent as consisting of a number of attributes which are

largely inborn. However, he believed that one very important component of musical aptitude, tonal memory, was a condition that can be learned. He referred to this aspect of talent as the "mind's ear," and stated that it could be developed substantially through training, but would diminish with nonuse. According to Seashore, a musician's use of a "reproductive imagination" is the mark of musical intelligence, because tonal imagery is necessary for the learning, retention, recall, recognition, and anticipation of musical facts. In musicians, Seashore states, the "imaginal type" that dominates is the auditory type, and secondarily, the motor type.

Edwin Gordon has had a major impact on the development of music aptitude in the United States. He bases his measurement of music aptitude on the concept of "audiation," which can be understood as a designation for auditory imagery. Audiation occurs "when one hears music through recall or creation (the sound not being physically present) and derives musical meaning" (Gordon 1987, 13). He also refers to audiation as the "mind's ear" or "the musical mind at the representational level." Musicians make internal decisions about music-making and how to perceive and discriminate sound through audiation.

Many pianists and teachers advocate the idea of "hearing" a note before playing it in order to imagine the exact tone, dynamic shading, and other desired expressive nuances. Some researchers believe that imagery may facilitate perception by "priming" mechanisms in the visual and aural system, preparing them to receive information about a particular object or event. In other words,

imagining an object may speed up perception by initiating the correct perceptual processes beforehand. It has been proposed by Ulric Neisser (1976) that images generally function as perceptual "anticipations," but they are only noticed when the expectations are not fulfilled.

In describing his compositional technique, Henry Cowell (1926) stated that the entire process evolved from mental rehearsal and auditory imagery. He stated that

> The most perfect instrument in the world is the composer's mind. Every conceivable tone-quality and beauty of nuance, every harmony and disharmony, or any number of simultaneous melodies can be heard at will by the trained composer; he can hear not only the sound of any instrument or combination of instruments, but an almost infinite number of sounds which cannot as yet be produced on any instrument (p. 234).

His self-training began by mentally rehearsing pieces which he had heard in recitals. Through his auditory training, Cowell gained control of his spontaneous imagery and was able to hold it in memory so that he could begin composing from mental images. By the age of 28 when he wrote the article, he composed by consciously manipulating a germinal theme over and over in his head "in every conceivable way" for months before writing a composition down (p. 236). Through practice, he gained enough control over his auditory imagery to be able to write down entire compositions after he had already organized the form in his mind.

Agnew (1922a) studied the characteristic use of imagery by five famous composers. Schumann, Mozart, Berlioz, Tchaikovsky, and Wagner were selected because in their writing, they "expressed clearly the character and function of their auditory imagery" (p. 279). He found that for all five composers,

spontaneity of imagery was characteristic; the themes "came" to them, or were the result of an "inner impulse" (p. 287).

Schumann's imagery was very vivid and realistic. When he heard piano music, he could fill it in with the tones of other instruments, as though it were being played by an orchestra. Schumann composed through his "inner hearing," and advised others to compose with the aid of mental images alone rather than the use of an instrument. Berlioz also objected to the use of an instrument in composing, dubbing the piano "the grave of original thought" (p. 284). Mozart attributed his remarkable memory to his auditory imagery. At the age of six, he composed in mental music without the aid of an instrument.

In addition to auditory imagery, Schumann also had vivid visual imagery and composed with the aid of "pictures," developing them simultaneously with his musical thought. Similarly, Wagner visualized scenes and characters for his operas at the same time that he heard the music for them in his imagination. Mozart compared his mental hearing with a picture, stating that he was able to hear his compositions mentally as a whole, "so that I can survey it, like a fine picture or a beautiful statue, at a glance" (p. 283).

There is an apparent relationship between the development of auditory imagery and musicianship, and many educators seem to advocate auditory imagery rehearsal and development. Although composers like Mozart and Tchaikovsky seem to have possessed this ability naturally, the example of Cowell shows that auditory imagery can be refined and developed through regular practice, much like the playing of an instrument.

Education

Many educators are beginning to recognize the importance and usefulness of imagery. Beverly-Colleene Galyean (1983) states that visualization, guided imagery, and imagery-based curricular activities are on the rise in many education programs. She believes that imagery activities can serve the standard curriculum in two ways: as preparation for learning and as course content. Teachers often begin classes with music to induce relaxation, followed by deep breathing and sensory awareness exercises. Students are later introduced to longer, guided sensory imagery journeys. When they have achieved a state of relaxation and concentrated focusing, they begin the lesson for the day. Shorter focusing exercises, such as picturing a specific object in detail or picturing a shape and changing its color, can be used throughout the day to quiet mind chatter, dispel distractions, and sharpen mental attentiveness.

Imagery used in elementary and secondary school courses usually falls into one or more of three categories: guided cognitive imagery, guided affective imagery, or guided transpersonal imagery. Guided cognitive imagery is used to develop thinking skills and accelerate mastery of cognitive material presented in class. An example would be a geometry class where students memorize shapes by visualizing them and checking to see if the internalized shape agrees with the definition.

Guided affective imagery is used as a tool for awareness and acceptance of self and others. Students learn to become comfortable with introspection and self-disclosure through these exercises, examples of which include conflict resolution through imagery and bonding activities with their peers. Guided transpersonal imagery includes mystical, psychic, and spiritual dimensions. Talking with personal guides, archetypal

figures, and communicating with spiritual symbols are ways of exploring transpersonal imagery (Galyean 1983).

At the Center for Integrative Learning, an empirical study was done which showed the positive effects of imagery activities on a group of high school Spanish students. The students ranked in the lowest 25th percentile of reading ability, disliked learning Spanish, and lived in high-risk areas for gang activity. After four months of imagery which included positive imagery of success in the class, outside evaluators noticed a significant decrease in disruptive behaviors, and a significant increase in Spanish skills (Galyean 1980). Other research by Galyean shows that students taught with imagery processes tend to score significantly higher on measures of cognitive evaluation for oral and written communication as well as reading and writing skills (Galyean 1980).

Problem Solving

Imagery seems to play an important role in human problem solving. One may define "problem solving" by stating that an individual has a problem when he or she has a goal, but is uncertain as to what series of actions to perform to reach it. The studies related to problem solving have mainly defined "imagery" as equivalent to visualization, rather than imagery related to the use of other senses (Kaufmann 1984). However, it may be possible to transfer the positive findings from research on the relationship between verbal memory and mental practice to aural and muscular memory as well.

The research on imagery and its relation to problem solving indicates that it plays an important role in that area. A general tendency seems to be that imagery has increasing functional importance when the task increases in novelty and complexity. It also seems that major significance is assigned to imagery in regard to the creativity dimension of problem solving (Kauffman 1984).

In a comprehensive study of the biographic and autobiographic literature on creative acts, Rugg (1963) described the process of problem solving as occurring in two stages. The first stage, discovery, involves imagery activity, while the second stage, verification, involves the more logical and directed verbal symbolic system. According to Rugg, the major components of productive problem solving are "a well-filled storehouse of imagery to guarantee richness and freedom of associations" (Rugg 1963, 311).

Focusing specifically on the creativity aspect of problem solving, Shepard (1978) suggested that the following characteristics of imagery were important: 1. imagery is less constrained by tradition than is language; 2. the richness of imagery makes it possible to note details and relationships that cannot be adequately represented by verbal means; 3. the spatial character of images makes them capable of spatial manipulation; and 4. vivid images may more adequately substitute for corresponding external objects and events than a purely verbal representation. Arieti (1976) also assigns imagery a crucial role in creative thinking.

The importance of spatial visualization has been emphasized in relation to mathematical-quantitative ability. An experiment by Burnett, McLane, and Dratt (1979) found a clearly significant correlation between scores on a spatial visualization test and

mathematical-quantitative ability at an advanced level. This finding demonstrates that imagery may play a crucial role in abstract problem solving, particularly at the advanced level.

Mental simulations can provide insights that might have been overlooked if only formal or analytical methods were considered in solving problems. Imagined simulations can be combined with other problem-solving techniques, such as the use of analogies or the technique of working backward, to help people arrive at correct solutions (Finke 1989).

Medicine

Around the turn of the century, Emil Coue, a French pharmacist, founded a clinic based on the use of positive imagery for attaining maximum health. He stated that

> the power of positive suggestion plants a seed which redirects the mind—and through the mind the body—toward a positive goal. Using phrases and positive thoughts regularly as part of a routine relaxation process is one of the best ways to weaken the power of negative images (Jaffe and Bresler 1980, 260).

Indeed, research of the twentieth century has demonstrated the power of mental images to heal physiological illnesses. Malva Freymuth states that imagery can be used to help rehabilitate musicians who have been injured and are unable to perform (Freymuth 1999), and sport psychologists advocate the use of imagery to heal sports injuries (ed. Anderson 2000). Cancer patients and other people with illnesses have sought help from their diseases through mental imagery, and research has shown that such techniques are beneficial. Although the present study will not delve into the use of

imagery for healing or rehabilitation, the research from other studies may be used to represent the power of imagery and the connection between the mind and body.

The civilizations of ancient Egypt, Babylonia, Assyria, India, Iran, Greece, and Rome all used various visualization techniques in their healing processes. Disease was thought to be cured by the mind, by visualizing perfect health (Jayne 1925). In ancient Babylon, Egypt, and Greece, and in medieval Europe, conscious symptoms of disease were believed to represent evil spirits, but mental images of curative spirits were often found to have curative effects (Samuels and Samuels 1980). During the Renaissance, the medical establishment began to dismiss the curative effects of imagery as it established the independence of mind and body. The "epiphenomenalist" viewpoint came into being during this period, stating that consciousness of either perceptual or imaginal events did not result in physiological or behavioral changes (McMahon 1976).

Recent evidence, however, has shown that conscious imagery can be used to control involuntary muscles (such as those determining heart rate), affect the chemical composition of bodily fluids, trigger perceptual responses in sensory organs like the eye, increase tolerance of painful sensations, and promote the cure and prevention of specific illnesses (Sheikh and Kunzendorf 1984).

Jaffe and Bresler (1980) suggest there there are two fundamentally different higher order languages used by the nervous system: verbal thoughts and the language of imagery. The somatic nervous system is accessed most directly by verbal thoughts. For example, if a person thinks "stand up," their voluntary nervous system will coordinate the proper muscular activity. The autonomic nervous system (ANS), on the other hand, is accessed most directly by the

language of imagery. The ANS regulates breathing, the heartbeat, blood chemistry, tissue regeneration and repair, immune and inflammatory responses, and many other bodily functions which are essential to life.

An example given by Jaffe and Bresler (1980) is a demonstration of a physiological change arising from the use of imagery:

> First, using verbal language, order yourself to "manufacture and secrete saliva." By thinking about this command, see how much saliva you can generate. . . Mental imagery represents a different approach to physiological change. Imagine that you have in your hand a big, yellow, juicy lemon. Now, take a deep bite of your imaginary lemon and begin to sense that tart, sour lemon juice splashing in your mouth, saturating every taste bud of your tongue so fully that your lips and cheeks curl. Swirl it in your mouth for another 15 to 20 seconds, bathing every corner of your mouth with its acrid taste (p. 254).

As demonstrated by the above example, a single mental picture can be much more powerful than any number of words. Many clinicians have begun to use positive images to help their patients heal themselves. The founding of scientific psychology brought with it the scientific study of heart-rate control through imaging. Since then, heart-rate control through imaging has been reported in many scientific studies (Sheikh and Kunzendorf 1984). Imaging emotions produces an even larger effect on heart rate, as Bauer and Craighead (1979), Lang (1979b), and Leber (1979) found. Schwartz, Weinberger, and Singer (1981) found that imaged emotions affect not only heart rate, but also have an independent effect on blood pressure. Although imaged anger and imaged fear increase heart rate to the same extent, imaged anger causes a greater increase in diastolic blood pressure than does imaged fear. Ahsen (1973) and Leigh (1978) found that some hypertensive subjects could use imagery to reduce their blood pressures.

Imagery is proving useful for the treatment of disease. Instructing subjects to image that a painful sensation feels more numb or more pleasant increased both their

subjectively reported tolerance of pain and their behaviorally measured tolerance (Anderson 1975; Horan and Dellinger 1974; Jaremko 1978).

In treating disease itself, imagery has been employed in beneficial ways. Patients undergoing surgical and chemical treatments for cancer reportedly have survived longer and been cured more frequently, through routinely imagining that their immunological systems are attacking their tumors (Scarf 1980; Simonton, Matthews-Simonton, and Sparks 1971). Additionally, people with allergies to specific foods have been able to consume those foods without becoming sick, by imagining that other foods were being eaten instead (Ikemi 1965). Armstrong (1953) found that imagery may be used to correct bad posture and therefore cure back pain.

The most common therapeutic use of mental imagery is in the induction of the "relaxation response." Excessive daily stress often contributes to chronic activation of the sympathetic nervous system. The relaxation state can act as an antidote to this stress because it is characterized by parasympathetic dominance, muscle relaxation, and slowed respiration. The introduction of mental images that suggest physical regeneration and deep rest are helpful in reaching this state (Jaffe and Bressler 1980).

Muscular Efficiency

In a book titled *Human Movement Potential: Its Ideokinetic Facilitation*, Dr. Lulu Sweigard (1974) proposed a method for teaching body balance and efficient movement through imagery. He stated that the teaching of movement has generally dealt with conformity rather than efficiency of movement. Efficient movement means that

only the necessary amount of energy should be used to hold and move the structure, or the skeleton. To teach muscular efficiency, "all voluntary contribution to a movement must be reduced to a minimum to lessen interference by established neuromuscular habits" (Sweigard 1974, 6).

Sweigard's teaching method used imagined movement in which the idea of movement occurs in one's body in a specific place and direction but is not voluntarily performed. He used the term "Ideokinesis" to describe the philosophy of this teaching procedure, a term which was first used by Luigi Bonpensiere in *New Pathways to Piano Technique* (1953). Sweigard states that:

> Experience in the use of imagined action in teaching posture and in solving problems of movement has shown that the central nervous system makes no mistakes in choosing an efficient neuromuscular action in its response to visualized movement, if such movement is allowed by the design of the skeletal structure and physical laws, and when there is no interference from voluntary movement (Sweigard 1974, 227).

A laboratory study by Suinn, Morton, and Brammell (1980) used VMBR to train members of a university track team in "how to run relaxed" during an event. The goal of the study was to eliminate the inefficiency associated with muscle tension during performance. Eight VMBR and eight control subjects were used. Subjects were first trained in relaxation, followed by VMBR with imagery involving the identification of muscle signs of tension in running, and cues for running in a more relaxed manner. Subjects were encouraged to employ the more relaxed style during *in vivo* training and in between VMBR sessions. Total training in VMBR covered eight sessions.

The researchers predicted that running "more relaxed" would lead to greater physiological efficiency since less effort would be used. Physiological and self-report measures were used. Subjects ran for ten minutes to establish a

baseline for workload levels (for example, at 75% of their anaerobic threshold), and were then instructed to "run relaxed" for ten minutes. Results indicated that the three female runners showed a significant mean decrease in heart rate from the first to the second ten minutes. Additionally, there was a trend for oxygen consumption to decrease during the second ten minutes. Both of these changes were in keeping with the hypothesis that "running relaxed" should be more efficient, and that VMBR can aid in the acquisition of this style of running (Suinn 2001).

Mental Practice Research in Sport Psychology

As early as 1892, psychologists were interested in the relationship between thought and motor movement. Between 1900 and 1940, most of the investigations on mental practice applied to motor skills were conducted by psychologists. These researchers were mainly concerned with the nature of neuromuscular action during mental practice as it affected skills such as maze learning, lighting a sequence of lights, and piano playing. During this time, investigations were primarily interested in the "pure mental" practice approach to learning rather than the combination of physical and mental practice (Vedelli 1985).

Various experimental designs have been employed to study the effects of mental practice on skill acquisition and performance. Experiments on skill acquisition have

typically employed three basic groups of subjects, either randomly drawn or equated on the basis of initial performance levels. Most studies compare initial performance with final physical performance. The number of subjects and amount of time spent in physical and mental rehearsal has varied considerably. Experiments typically employ three types of practice conditions: a physical practice group; a mental practice group; and either a group that uses a combination of physical and mental practice, or a control group that does not practice at all.

Before the field of sport psychology even existed, an early article by Anderson (1899) promoted the idea of mental practice and had a great influence on later researchers. Anderson reported that gymnastic movements could be learned if only the mind were trained without actual use of the muscles. His statements were not backed up by statistical analysis, but his concepts of the positive effects of introspective rehearsal would come to be supported by later researchers.

The first significant study related to mental practice was conducted by Vandell, Davis, and Clugston (1943). The greatest implication of this study was that it was the earliest of its type, and provided a groundwork upon which most current studies are based. Attempting to isolate the effects of mental practice in the learning of a new skill, the researchers took a group of twelve senior high school boys who practiced 35 standard basketball free throws under one of three conditions. The conditions were either practicing physically on day one and day 20; practicing physically on each of the 20 days; and practicing physically on day one and day 20, with 15 minutes of mental practice from the second to the nineteenth day. The high school boys improved 2% under condition one, 41% under condition two, and 4% under condition three. Results

indicated that positive improvements were made by both the physical practice and mental practice groups.

Meta-Analyses of the Literature

A meta-analysis of 60 studies on mental practice was undertaken by Feltz and Landers (1983) to summarize the findings from the vast amount of research on mental practice. The article contains a catalogue of the studies complete with a summary of characteristics and effect sizes. The studies were limited to those containing a group that was given only mental practice and that had either pre-test scores or a control group for comparison. Of the 60 studies yielding 146 effect sizes, the overall average effect size was .48, suggesting that mentally practicing a motor skill influences performance better than no practice at all.

Effect sizes were compared on a number of variables: subject characteristics (age, sex, and previous experience with task—whether subjects were novice or experienced); type of task (motor, strength, or cognitive); design characteristics; and published versus unpublished studies. Of all the characteristics examined, they found that the most relevant was whether the task was primarily motor or cognitive. Results from these comparisons indicated that studies employing cognitive tasks such as card sorting or maze learning had larger average effect sizes than motor or strength tasks. These large effects for cognitive tasks were most often achieved in a relatively short practice session (an average of 3.17 min) and with only a few trials (a mean of 4.17).

The researchers examined the two most common theories of mental practice: the symbolic learning explanation and the psychoneuromuscular explanation. The researchers concluded that it was doubtful that mental practice effects are produced by low-gain innervation of muscles that will be used during actual performance as proposed in the psychoneuromuscular theory. They claimed that very few quantitative studies exist to support the theory, and they do not include motor performance measures as a dependent variable. In addition, the fact that mental practice was more effective for tasks high in symbolic or cognitive elements lends support to the symbolic learning theory.

The researchers proposed that mental practice functions to assist the performer in psychologically preparing for the skill to be performed. This statement is supported by the fact that the minimal tension levels accompanying mental practice may help to prime the muscles to improve performance in speed and strength tasks. This priming has been found to be necessary for maximum proficiency in a coordinated hand movement (Johnson 1928).

Results indicated no significant relationships between the number of practice sessions and effect size. They also indicated that mental practice effects are not just limited to early learning—they are found in both early and later stages of learning. For tasks high in symbolic or cognitive elements, however, mental practice will be most effective when subjects have had some prior practice with the task.

Driskell, Copper, and Moran (1994) conducted a second meta-analysis of the literature on mental practice which contained a greater limitation on the kinds of research studies accepted into the analysis. Whereas Feltz and Landers (1983) included

any study on the effects of some form of mental practice on motor performance, this study had more selective criteria. Studies were excluded if they used a composite of mental practice with any of the following: physical practice, modeling, relaxation, positive imagery, or emotional arousal. Studies were also required to have a control group which did not engage in any type of practice. One goal of the study was to establish the overall magnitude of the effect of mental practice on performance. Results indicated that mental practice has a moderate and significant impact on performance, but the effects of mental practice are weaker than the effects of physical practice.

A second goal was to test hypotheses regarding the nature of the relationship of mental practice to performance. With this in mind, they examined the following five areas: type of task, retention interval, experience level of trainees, duration or length of practice, and type of control group.

Tasks were compared on the basis of whether their type could be classified as being primarily cognitive or physical/motor in nature. Of the 30 cognitive tasks, the combined effects of the studies were moderate in magnitude and significant. The 32 physical tests were based on muscular strength, endurance, or coordination, and their combined effects were small in magnitude and significant. Like the previous meta-analysis, these researchers also found that the more a task requires strength and coordination requirements, the less effective is mental practice. Mental practice is effective for both cognitive and physical tasks, but the effect of mental practice is significantly stronger the more a task involves cognitive elements. This finding does not support the psychoneuromuscular theory, which suggests that mental practice effects would be greater for primarily physical tasks.

The retention interval, or the time interval between practice and assessment, was also examined. Data indicated a significant negative relationship between the length of the retention interval and the magnitude of the mental practice-performance effects. The strongest effect of mental practice was obtained with the shortest interval period, which was when performance was tested immediately after practice. The initial effects were reduced by half their magnitude if the retention period was extended to 14 days. After 21 days, the beneficial effects deteriorated to less than .1. Therefore, maximum benefits of mental practice would be gained with refresher training on at least a 1- to 2-week schedule.

The comparison of effect sizes between experienced and novice subjects was not significant, indicating that both beginning and more advanced musicians or athletes can benefit from mental practice. For novice subjects, however, the results indicated stronger effects of mental practice for cognitive tasks than for physical tasks. For experienced subjects, there was no significant difference for cognitive or physical tasks. Because experienced subjects benefit equally from mental practice regardless of task type, this supports the symbolic explanation. Experienced subjects have the schematic knowledge necessary for the benefits of mental practice to be optimized.

Test duration varied across the studies from 30 seconds to 80 minutes. There was a significant negative relationship between the duration of mental practice and the magnitude of effect: as the overall length of mental practice increases, the beneficial effect on performance decreases. The authors state that a practical guideline for implementing mental practice suggests an overall training period of about 20 minutes.

The number of practice trials was not found to be a significant predictor of the effects of mental practice.

Richardson (1967a) questioned whether the gain in performance attributed to mental practice may be a result of increased motivation based on the fact that one group receives some type of treatment, while another receives no treatment. In the studies included in the Driskell, Copper, and Moran (1994) meta-analysis, the researchers examined two types of control groups in order to assess whether the type given no treatment resulted in more significant effects being attributed to mental practice. Some studies employed a group with whom they had no contact between initial assignment and data collection. Others used an equivalent control group, which engaged in a non-treatment activity for a period equivalent to the practice time of the treatment group.

The effect size of the equivalent group, which was used in 20 tests, was small in magnitude and nonsignificant. The no-contact group, used in 39 tests, had an effect size that was significant and had a somewhat larger magnitude. Although there is a trend for mental practice to be more effective with a no-contact control group, the difference was not significant.

Slow-Motion Mental Practice

In addition to the comparison of mental, physical, and combination practice groups, researchers have studied the relationship of other factors in the effectiveness of mental practice. A common belief among some sport psychologists is the idea that slow-motion imagery might enhance the effectiveness of mental practice by enriching a

subject's imaginal experience. Andre and Means (1986) speculated that the vividness of slow-motion imagery would result in more careful attention to accuracy, and therefore fewer mistakes in execution. The researchers studied a method similar to VMBR, with relaxation followed by imagery rehearsal. Sixty-six volunteer subjects aimed a Frisbee disk at a basket under three conditions: VMBR, VMBR in slow motion, and a placebo control. The slow motion group was hypothesized to be beneficial since "it can lead to more vivid and clear-cut experiencing of the imagined motor task" (p. 124).

For their study, pre- and post-test comparisons were obtained for three groups: a standard mental practice group (MP), a slow-motion mental practice group (SMMP), and an attention placebo control group. The task performed by the 66 male subjects was the "putting" stroke used in Frisbee disc golf.

Both the mental practice and slow-motion mental practice procedures included audiotaped instruction of a brief mental practice treatment rationale, a 45-second relaxation phase, and closely guided visual, kinesthetic, and affective imaginal practice of the putting throw. The slow motion mental practice group was instructed to perform the second and third trials of each set in slow motion. In fact, the researchers were surprised to find that the VMBR group showed an increase of 10.94% in accuracy, compared to 5.62% for slow motion VMBR and 1.57% for the placebo group.

Results indicated that subjects in the standard mental practice group improved more than those in the slow motion group, but not significantly. Procedural problems with the investigation may have included inattention by the subjects, low subject motivation, and a lack of understanding of the slow-motion

factor. The questionnaire indicated that although SMMP subjects' experiences were "slower" than the mental practice of MP subjects, it was not a significant difference.

Mental Practice and Intelligence

Clark (1960) was interested in how intelligence and experience with a task mediate the effects of mental practice. He compared the effect of mental practice with that of physical practice in the development of a motor skill: the Pacific Coast one-hand foul shot. Subjects in the study were 144 high school boys who were divided into physical and mental practice groups on the basis of arm strength, intelligence, and varsity, junior varsity, or novice experience.

The study demonstrated that intelligence as measured by the Short Form of the California Mental Maturity Test had no statistically significant influence on mental practice gains. Both the physical and mental practice groups showed highly significant gains. Mental practice was almost as effective as physical practice for the varsity and junior varsity groups, but was not as effective for novice groups. The novice groups were most successful in utilizing physical practice, and made the most gains during the experiment from both mental and physical practice. During introspective analysis, all of the mental practice subjects reported a growth of the ability to visualize and imagine the shooting technique to some degree. Clark credited the introductory training period with this development in imagery skill.

The fact that novice subjects in Clark's study gained more improvement from physical practice than from any combination of mental and physical practice demonstrates that prior experience with a task helps to support the efficacy of mental practice. However, novice subjects can still benefit from mental practice, even at the beginning stages of study. Jones (1965) divided male university students into two groups who had been given different prior learning treatments. The subjects learned a gymnastic skill to a pass-or-fail criterion. Results indicated that it is possible for subjects without previous experience in the task to learn gross body skills without physical practice.

Another study on the relationship between intelligence and the effect of mental practice on the performance of a motor skill was undertaken by Start (1960b). In this study, mental practice led to a significant improvement from the initial pre-test on an underarm basketball free throw. The improvement was not related either to the subject's initial score or to the IQ of the boys as obtained from the Northern Tests of Educability in England.

Mental Practice and Simulated Movement

A study by Mendoza and Wickman (1978) included a group of subjects who used a simulated dart-throwing motor movement along with their mental practice. The researchers were interested in whether mental rehearsal with simulated movement differed from purely mental practice. Subjects were randomly separated into four practice conditions: no-practice control, mental rehearsal only, mental rehearsal with

simulated dart-throwing movements, and direct physical practice. All groups differed from the no-practice group, but direct physical practice resulted in significantly higher improvements than any other form of practice. There was no statistical difference found between the two mental practice groups. Physical practice was found to be more effective than either type of mental practice, which in turn were much more effective than no practice at all. Simulated movement with mental practice did not differ from mental practice alone.

Mental Practice and Task Difficulty

A study by Phipps and Morehouse (1969) revealed that mental practice seems to facilitate simple tasks more than complex ones in which there is a need for some physical practice. Rather than concentrating on a single skill, this particular study was undertaken to determine the relative effects of mental practice on learning motor skills of varied difficulty. By varying the difficulty of the task, the researchers hoped to discern the relative importance of task difficulty on the effectiveness of mental practice.

Eighty male volunteers were randomly assigned to either a control or a mental practice group for the learning of three motor skills. All subjects were tested individually on each of the skills, but one group participated in five directed mental practice sessions spaced over a period of five days. Subjects in mental practice sessions were asked to close their eyes, relax, and imagine themselves performing the skill as they were directed through repetitions of it. After physical

practice was introduced, the mental practice group required fewer trials to achieve success in the hock swing and the jump-foot, but not in the more difficult skill called the soccer hitch kick. Results indicated that the effectiveness of mental practice without prior physical practice is specific to the skill and is more pronounced for simpler skills.

Mental Practice and Motivation

Researchers are also interested in whether the use of mental imagery has any effect on motivation. Martin and Hall (1995) assigned 39 beginning golfers to two groups: an imagery treatment condition or a no-imagery condition. They wanted to test whether subjects who used mental imagery would spend more time practicing a golf-putting task and therefore have higher "task-specific self-efficacy" than their counterparts. All subjects were taught how to putt a golf ball during the first three sessions, and imagery treatment subjects also participated in an imagery training program. After being told that the emphasis of the study was on performance, subjects in the imagery group spent significantly more time practicing the golf-putting task than subjects in the control group. These subjects also set higher goals for themselves, and adhered more to their training programs outside of the laboratory.

In a study like this, it is possible that results are confounded by the Hawthorne effect. This creates a situation where subjects in the treatment group are motivated more than those in the control group because they are under special treatment and therefore believe that they should get higher scores.

The Combination of Mental and Physical Practice

The greatest support for the use of mental practice has been provided by research studies in which one experimental group combines physical and mental practice. This finding suggests that musicians can make the most progress by alternating physical practice with mental practice.

Egstrom (1964) combined mental and physical practice treatments in three different ways in a study designed to measure the effects of varying emphasis on mental practice (which the author referred to as "conceptualizing practice") and physical practice (which he called "manual practice"). He divided 120 male subjects with a right-hand preference into six groups, including an all-physical practice group, an all-mental practice group, an early-manual group, an early-conceptual group, and a group that alternated conceptual and physical practice in each successive practice session.

Each subject was given an initial test on his ability to use a wooden paddle with his nonpreferred hand to strike a small rubber ball in order to hit a large target on a wall twenty feet away. A ball was projected from a tube once every twelve seconds so that the subjects had to change the flight of the ball ninety degrees in order to hit the target. Subjects were able to observe two practice flights of the ball before the test was started, and a series of twenty-five balls was then dispensed from the machine for the test.

The early-manual group practiced physically during the first five practices, and conceptually during the second five, whereas the early-conceptual group practiced conceptually, and then manually, for the same duration of five sessions each. Conceptualizing practice consisted of a timed five-minute period during which the

subject was told to focus his concentration upon mental rehearsal of the skill performed during the initial test.

Results indicated that the mean score for the all-physical group was not significantly different from the mean score for the group with alternating periods of manual and mental practice. These findings suggest that mental practice is especially effective when combined with physical practice, especially when subjects alternate between the two types of practice. Practice that emphasized conceptual techniques during the first three weeks of the study was less effective than the other types which incorporated early manual practice.

Stebbins (1968) found that two different combination treatments resulted in the greatest amount of improvement compared with a control group and mental practice-only group. In this study, 93 male volunteer students were tested on an experimental apparatus consisting of a target and five rubber balls which were thrown at the target. The balls were meant to be aimed at the target so that they would be lodged in one of 81 four-inch compartments arranged in a bull's eye pattern. One combination group practiced mentally for the first nine sessions and physically during the second nine sessions, while the second combination group practiced in the reverse order. A physical practice, mental practice, and control group also participated in the study.

The combination treatments were superior to both the mental practice and the control groups, but the position of the physical practice group was ambiguous. It was not found to be significantly different from the mental practice group, the control group, or the combination treatments. The mental-physical group's tenth practice session, or

the first physical practice session for this group, and the physical-mental group's ninth practice session, or the last physical practice session for this group, were nearly equal.

Many other researchers have echoed these findings: that physical practice is superior to mental practice when both are used by themselves (Hird, Landers, Thomas, and Horan 1991; Mendoza and Wickman 1978), but the combination of mental and physical practice leads to equal or greater improvement than physical practice used by itself (Riley and Start 1960; Oxendine 1969; Egstrom 1964). In a study utilizing the effect of different combinations of mental and physical practice in both a cognitive and motor task, Hird, Landers, Thomas, and Horan (1991) indicated that the combination did not differ from mental practice alone, but they noted greater task gains as the relative proportion of physical practice increased. These findings are consistent with those of Ryan and Simons (1982), Whitley (1962), and Trussell (1952), who revealed that the alternation of physical and mental practice led to better skill acquisition than physical practice alone.

Mental Practice Research in Music

Although some early studies on mental practice were related to music, especially the memorization of piano music (Rubin-Rabson 1940a, 1940b, 1941), research on mental practice in music disappeared after the 1940s and did not reappear for over forty years until after music educators began hearing about similar efforts in the field of sport psychology. Most of these later experiments in the field of music have studied the

effect of mental practice versus physical practice on sight-reading skills using a pre-test/post-test experimental design. Often researchers have added a third type of practice to the study in which mental practice and physical practice are combined, or subjects alternate between the two types of practice.

It is necessary for musicians to learn how to use mental practice for two very important reasons: first, too many hours spent practicing at one's instrument can lead to overuse, tension, and possibly injury. Secondly, musicians often find themselves in situations where they cannot practice at an instrument. It may be because they are on an airplane flying to a performance; they may not have access to an instrument while they are out of town; or they may be injured and simply unable to physically practice for a certain amount of time. At times like these, the only way to practice is to practice mentally. But even when musicians are able to practice at their instrument, the alternation of physical with mental practice has been found to be at least as beneficial as the same amount of physical practice.

Mental Practice and Memorization of Music

An early study related to mental practice required subjects to precede physical practice with mental practice in order to memorize piano music (Rubin-Rabson 1941). The researcher was not interested in comparing the usefulness of mental practice versus physical practice, but wanted to discern the most efficient way to memorize music. Nine subjects studied nine samples of unfamiliar piano music without physical practice for three-, six-, and nine-minute periods. Following their mental practice sessions, they

attempted, through as few trials as possible, to play a memorized rendition of the piece. At the end of each study period, the subjects tried to transcribe the piece from memory. Two weeks later, the piece was relearned to determine the relative retention values of their preliminary study.

It was found that the number of keyboard trials required to reach a perfect memorized performance after three minutes of study was significantly reduced when the study period was doubled. When the study period was tripled, however, it offered no advantage over the doubled one. Similarly, the transcription scores showed a statistical difference between the three- and six-minute study periods, but little difference between the six- and nine-minute periods. The extended period was found to have no effect on retention.

Results of the study indicated that mental practice overlearning was superior to physical practice overlearning in the retention of memorized keyboard music. The researcher suggested that a composition should first be studied as a whole to ascertain the details of structure and form. Shorter units should then be studied individually and later attempted at the keyboard from memory. She stated that it is more efficient to divide pieces into units than to learn a whole piece, and then memorize it (Rubin-Rabson 1941).

Mental Practice with Listening

Another study which applied mental practice tactics to learning piano music was done by Lim and Lippman (1991). In addition to mental and physical practice alone, this study employed mental practice with listening as an additional technique for using mental practice. In this type of practice, subjects were required to examine scores while listening to recordings of these scores which were considered to be "ideal performances" by the researcher. Excerpts from compositions by Weiner, Fauré, Haydn, Schumann, Válenti, and Mendelssohn were used in the study. The subjects were seven piano performance majors at a university who were asked to use visual, auditory, and kinesthetic imagery in their mental practice sessions.

The subjects attempted to play short, unfamiliar selections from memory after practicing them for ten minutes in one of the three practice conditions. Two independent judges rated taped performances on the dimensions of note accuracy, rhythmic accuracy, phrasing, and dynamics. The researchers made an important finding that mental practice with listening yielded superior results over mental practice alone.

It is important to remember that in this particular study, the subjects were using mental practice with listening at the beginning stages of learning a piece. Perhaps in the later stages of learning a piece, the auditory imagery in a musician's own mind would make up for the lack of an actual aural model. One could argue that listening to an "ideal performance" at the later stages of learning a piece would be detrimental because it would keep the musician dependent on another performer's interpretation.

Other results from the Lim and Lippman (1991) study indicated that physical practice led to the best performance. Subjects in this study were not given pre-training

tactics in mental practice, so that many of them were unfamiliar with the technique when the experiment began. However, the use of mental practice over the six successive days of experimentation resulted in better scores when compared with mental practice at the beginning of the study. The authors suggested that the higher scores were a result of the replications effect, since the subjects gained an increased awareness of how to use their new image-generating skills.

Mental Practice and Simulated Movement

Ross (1985) conducted a study to examine the relative effectiveness of mental practice in improving trombone performance. In this study, thirty trombonists from three colleges were randomly assigned to five experimental practice conditions: all physical practice (PP), all mental practice (MP), a combination of physical and mental practice (CP), mental practice with a simulated slide movement (MPS), and no practice, or a control group (NP). The mental practice group was encouraged to "see," "hear," and "feel" themselves as vividly as possible playing the selected etude. The researcher was interested in whether the use of body movement rehearsal techniques, such as a simulated slide movement on the trombone, would produce better results than mental practice alone. A similar study was done in the field of sport psychology on dart-throwing (Mendoza and Wickman 1978), which did not find a significant difference between mental practice with or without simulated movement.

Pre-tests and post-tests consisted of tape-recorded performances which were scored by evaluating pitches, rhythms, and articulations. This type of evaluation avoided the subjective inclusion of judgments on sound quality or interpretation. Only three pairwise groups were found to be significantly different: CP and NP; CP and MP; and PP and NP. The CP group had the most substantial gain, but it was not significantly better than either the PP or MPS conditions. A combination of physical and mental practice was found to produce improvement in performance that was equal to all-physical practice. Because the MPS condition was not significantly different from the PP or CP conditions, and the MP group was significantly different than the CP group, the results of the study suggest that the use of body movement rehearsal techniques may potentiate the effects of mental practice.

Mental Practice and Aural Knowledge of Results

Coffman (1987a) was interested in the impact of aural knowledge of results during practice as an additional factor during mental practice. A similar study was done by Zecker (1982) who found that mental practice can be effective in improving psychomotor skill, despite the absence of knowledge of results. In Zecker's study on bean bag tossing, mental practice was found to be superior to physical practice with the lights extinguished just after release of the bag.

The subjects for Coffman's study included forty music majors who were divided into one of eight treatment conditions. Four practice conditions were used: physical,

mental, alternating physical and mental, and no practice. Each of the practice conditions were crossed with the presence or absence of aural knowledge of results. The study revealed that all three practice conditions had significantly shorter performance times than did the control condition. Physical practice treatment did not differ significantly from the alternation of mental and physical practice in improving performance times. Most significantly, treatments using physical practice and alternating mental and physical practice yielded significantly shorter performance times than did the mental practice treatment alone.

The practice procedures used by the subjects did not result in a significant reduction of the number of pitch or rhythm errors. This may have been a result of any of the following factors: the level of difficulty of the piece, the lack of experience of the subjects, or the fact that subjects were required to practice straight through the piece along with the metronome and were therefore unable to practice difficult spots. The presence or absence of aural knowledge of results did not make a significant difference. Physical practice was found to be necessary for superior psychomotor skill improvement, but mental practice alone was superior to no practice at all.

The Combination of Mental and Physical Practice

The effects of mental practice on the sightreading skills of wind instrument performers were studied by Wirt (1992) who used 80 junior high school students as his subjects. This study was similar to Ross's previous study in the sense that physical movement along with mental practice was studied as a separate treatment. The subjects

were randomly divided into five treatment groups: mental practice with no physical movement, mental practice with instrument and no physical movement, mental practice with instrument and physical movement, actual practice with sound, and no practice (a control group). A pre-test and post-test of sightreading skill was conducted, and the results indicated that mental practice when combined with physical practice was nearly as effective as actual practice.

One researcher studied the use of mental practice on twenty pianists and twenty organists. Geerlings (1998) divided the forty subjects into groups using four different practice types: physical, mental, alternating physical and mental, and no practice (control group). The effects of the different types of practice were determined by comparing the pre-test and post-test scores with regard to performance time duration, rhythmic error, and pitch error.

Mental practice was found to be an effective practice technique, specifically when used in alternation with physical practice. Results indicated a significant difference between the performance time durations of the physical and mental practice groups and the control group. With regard to pitch errors, there was a significant difference between the alternating practice group and the mental practice and control groups, with the alternating practice group making the most improvement in pitch errors.

The effects of mental practice versus physical practice on sightreading were also studied by Pierson (1992). Beginning band instrumentalists made up the subjects for this study, and they were required to sightread Selection #2 from Form A of the Watkins/Farnum Performance Scale for the pre-test. After a three-minute practice

session in their randomly assigned condition, subjects performed a post-test. Performances were tape-recorded and scored based on rhythm and pitch accuracy. Results showed that students in the physical practice condition scored significantly higher than those in the control group. Mental practice was not significantly different from either the physical practice or the no-practice group.

Many of the above studies indicate that physical practice is superior to mental practice when both are used exclusively (Coffman 1987a; Geerling 1998; and Ross 1985). Musicians should be advised that mental practice should not be used as a substitute for physical practice at their instrument. Although the studies have indicated that physical practice is superior to mental practice when both are used exclusively, they have also found that mental practice alone is superior to no practice (Pierson 1964; Coffman 1987a; Geerling 1998; and Ross 1985). This finding is important for students who are suffering from injuries or physical stress or are unable to practice at their instrument for other reasons.

Many research studies have indicated that alternating mental practice with physical practice has superior results when compared with using mental practice alone. Additionally, this combination type of practice has not been found to differ significantly when compared with physical practice alone (Coffman 1987a; Geerling 1998; Ross 1985; and Wirt 1992). Groups of subjects who combine mental and physical practice usually achieve the most successful results, and these studies have offered the most evidence for the usefulness of mental practice.

CHAPTER III

RESULTS

Five graduate students at the University of Oklahoma participated in the study which took place during the spring semester of 2005. All five participants were pursuing a master's degree in piano at the University of Oklahoma and were enrolled in applied piano lessons during the time of the study. These participants will be referred to in the document by pseudonyms which they chose on their own during the first group session. The participants included two males under the pseudonyms Matt and Stephen and three females under the pseudonyms Harrison, Margaret, and Annie. They attended five weekly group sessions in which they engaged in imagery and relaxation exercises.

Each participant also performed one memorized piece at each group session. The performances were videotaped each week, and the participants filled out an evaluation (appendix F) of their performance after watching the videotape. In addition to the group sessions, the participants completed mental practice, imagery, and progressive relaxation assignments three times a week. They kept Practice Logs

(appendix K) upon completion of the assignments and turned them in to the researcher the following week.

The participants were asked to choose a memorized piece with a duration of three to ten minutes. Matt's piece, "Les jeux d'eaux à la Villa d'este" by Franz Liszt, was the longest piece and took approximately ten minutes to play. Stephen performed Cappriccio Op. 76, No. 1 in F# minor by Johannes Brahms, which lasted approximately three and a half minutes, while Annie chose to work on the first movement of Alberto Ginastera's *Danzas Argentinas* which lasted less than three minutes. Harrison's chosen piece was the Prelude from the English Suite in F major by J.S. Bach. The Prelude lasted approximately six minutes. Margaret performed Frederic Chopin's Nocturne Op. 9, No. 1 in B-flat minor, which lasted just under seven minutes. Harrison was the only one of the participants who indicated to the researcher that she had a history of difficulty in dealing with performance anxiety.

At the first session, the researcher provided the participants with an explanation of the nature of the study after which the participants listed three goals that they wanted to meet by the end of the study. Setting goals is important because it enabled the participants to individualize the imagery and mental practice routines according to their own piece and what they wanted to get out of the study. Goal-setting provides individuals with an opportunity to make personal progress by first assessing the areas that need the most work. These goals were written on the List of Final Goals (appendix E); the participants could devise their own goals or choose from the list provided. The participants were asked to make the goals as detailed as possible.

Matt chose the following goals for his Liszt piece: accuracy, especially in rhythm, to create a more flowing sound with fewer "gaps" and better transitions; musicality and character, with more focus on color, less "notiness," and the achievement of a "water sound;" and increased technical fluency, including the attainment of a fuller sound with more dynamic control on the tremolos. In preparing his Brahms Cappriccio, Stephen chose the following goals: accuracy, so that he played the correct notes when moving quickly to a new section of the keyboard; musicality in obtaining an appropriate balance between the hands and bringing out the melody; and technical fluency on fast sixteenth notes, especially in the last section of the piece. Annie chose to focus on musicality for two of her goals. One of her goals was the inclusion of more dynamic contrasts and intensity, while another goal was to attain balance between the hands. Her third goal was related to technical fluency on a series of ascending clusters. Harrison's first goal was to attain solid memory, although she stated that she had "a hard time deciding between solid memory and accuracy" since her lack of solid memory contributed to inaccuracy. For her other two goals, Harrison chose the following: musicality, which she defined as improving her concept of the piece and transferring her work from the practice room to the concert hall; and concentration, so that she could stay focused on the music while playing in front of other people. Margaret chose the following three goals: confidence; solid memory, so that she could see the page of music and her hands playing it; and musicality, incorporating dynamic contrast and phrasing that helped build to the climaxes. In the area of confidence, Margaret stated that "I often feel like I don't

belong here—that I am not good enough." She wanted the study to help her to focus on "learning and working on feeling good about my playing and knowing I play well."

The goal of the present study was to elicit information about the impact of imagery, mental practice, and relaxation techniques on the regulation of anxiety, concentration, memory, self-efficacy or confidence, and a performer's conception of his or her overall performance. The present chapter will reveal the results of the videotape evaluations, imagery exercise worksheets, and practice logs in order to assess the participants' perception of the usefulness of these techniques. First, this chapter will assess any change in the participants' abilities in dealing with performance anxiety. Anxiety levels were measured at the beginning of the study as a pre-test and at the end of the study as a post-test by using the State/Trait Anxiety Inventory and the Personal Report of Confidence as a Performer (PRCP). After analyzing the results of these anxiety tests, information about the perception of performance change will be presented by describing the results of the videotape evaluations. The results of the progressive relaxation exercises and the guided imagery routines will be assessed by describing the comments and ratings on the Imagery Exercise Worksheets (appendix J). Mental practice techniques used in the study will be described and evaluated by assessing comments from the Practice Logs (appendix K). Finally, the participants' perceptions of the efficacy of mental practice, imagery, and relaxation techniques will be analyzed by referring to the results of the Final Evaluation and the final interview.

Analysis of Pre- and Post-Test Scores:

The State/Trait Anxiety Inventory (STAI) and Personal Report of Confidence as a Performer (PRCP)

One of the goals for using relaxation techniques, imagery, and mental practice was to help the participants learn to regulate their level of arousal during performance. When the level of arousal is too high and cannot be controlled, this is often referred to in the literature as "performance anxiety." Problems in dealing with anxiety can lead to memory problems, excessive muscular tension, and an inability to perform optimally.

In order to assess any changes in anxiety over the course of the study, the five participants completed both the State/Trait Anxiety Inventory (STAI) found in appendix C and the Personal Report of Confidence as Performer (PRCP) found in appendix D before the study began as a pre-test and prior to the final performance as a post-test. Both tests are self-evaluation questionnaires.

The State portion of the State/Trait Anxiety Inventory (STAI) is designed to assess how a subject feels at a particular time, and the Trait portion of the STAI is concerned with how a person generally feels at all times. In the context of musical performance anxiety, trait anxiety may be defined as a relatively stable and enduring aspect of a musician's proneness to anxiety. State anxiety may be defined as the relative intensity of a musician's anxiety at the time of a particular event such as a musical performance (Niemann, Pratt, and Maughan 1993). The

Personal Report of Confidence as a Performer (PRCP) was originally adapted by Appel (1974) as a way to investigate a musician's level of performance anxiety.

On all three tests, a high score indicates a high level of anxiety. The highest score possible on the PRCP is a score of thirty. The possible range of scores on the STAI is a minimum of twenty points and a maximum or eighty points. In comparing the pre-test to the post-test, there was a trend toward lower ratings on all three tests. This finding indicates that the level of anxiety felt by each participant prior to performance tended to be lower on the post-test than on the pre-test.

A non-parametric method was used to analyze the data because of the small number of subjects (n=5) and because the assumption of normality could not be assumed. The three continuous variables were summarized and pre- and post-test medians were compared using the Wilcoxon signed-rank test. P-values less than 0.05 were considered significant.

The Wilcoxon signed-rank test could only be used for the State portion of the State/Trait Anxiety Inventory. On this test, the p value was .062, which may not be considered statistically significant. On the Trait portion of the State/Trait Anxiety Inventory and on the Personal Report of Confidence as a Performer, one participant had the same test score on both pre- and post-test, so his score was not counted in the test. With only four scores, the n value was too small to calculate significance. However, on all three tests, there was an obvious trend for the participants to have lower scores on the post-test when compared with the pre-test score.

The following table demonstrates the change in scores between the pre-test and post- test of the State/Trait Anxiety Inventory (STAI) and the Personal Report of Confidence as a Performer (PRCP) for each individual participant.

Table 1

Comparison of Pre-Test and Post-Test Scores on the STAI and PRCP by Subject

	State			Trait			PRCP		
Subject	Pre-test	Post-test	Diff.	Pre-test	Post-test	Diff.	Pre-test	Post-test	Diff.
Matt	48	35	-13	35	35	0	13	6	-7
Stephen	49	46	-3	45	37	-8	11	11	0
Annie	49	38	-11	37	40	3	11	8	-3
Harrison	65	38	-27	56	39	-17	18	12	-6
Margaret	57	44	-13	49	47	-2	17	8	-9
Median	**49**	**38**		**45**	**39**		**13**	**8**	
Highest	65	44		56	47		18	12	
Lowest	48	35		35	35		11	6	
Range	22	9		21	12		7	6	
Wilcoxon signed-rank			*p*= .062			*n* too small			*n* too small
Mean	**53.6**	**40.2**	**-13.4**	**44.4**	**39.6**	**-4.8**	**14**	**9**	**-5**
SD	7.33	4.6	8.65	8.65	4.56	7.92	3.32	2.45	3.5

State/Trait Anxiety Inventory

The mean score on the State portion of the STAI was reduced by 13.4 points on the post-test, and the mean score on the Trait portion was reduced by 4.8 points. Matt had the lowest score on the pre-test and post-test on both the State and Trait portion. His score remained the same between the pre-test and post-test of the Trait portion. Harrison, on the other hand, had the highest scores on the pre-test for both the State and Trait portion, and she saw the greatest decrease in her score on both post-tests. This decrease in the high scores resulted

in a smaller range of scores on the post-test, indicating that the participants with low anxiety scores may have been impacted less by the techniques used in the study in the specific area of arousal regulation.

Since the State portion of the STAI relates to how a person feels at a particular time, and the test was taken prior to performance, the scores on the State portion may be used to assess the participants' levels of performance anxiety. All participants saw a decrease in their scores for the State portion of the STAI, with Harrison seeing a difference of 27 points. This finding indicates that over the course of the study, the participants were able to decrease the anxiety they felt prior to performance.

The Trait portion of the STAI is used to assess general anxiety levels, or how a person feels most of the time, rather than just before performing. Three of the five participants saw a decrease in their scores from pre-test to post-test on the Trait portion of the STAI, with a 17-point decrease for Harrison.

The mean between pre-test and post-test changed by a much larger margin on the State portion than on the Trait portion, even though both tests showed a reduction of the mean scores between pre-test and post-test. The mean for the State portion of the STAI was reduced by 13.4 points, and the mean for the Trait portion was reduced by 4.8. On the Trait portion, three participants saw a decrease in their score on their post-test, but Matt's score did not change and Annie's score rose by three points.

This is an interesting finding, showing that perhaps the participants' abilities to cope with performance anxiety were reduced more than their abilities to cope with anxiety in daily life. The imagery techniques used in the study were specifically related to performance preparation, and were always preceded by relaxation

techniques. They were therefore geared toward helping participants to reach an appropriate level of arousal prior to performance. In that respect, the imagery and relaxation exercises seem to have been successful because the individual anxiety scores in the State portion of the test were lower on the post-test. The progressive relaxation and imagery techniques were used as a way to reduce stress prior to performance, rather than as a tool to be used on a regular basis for coping with the demands of everyday stresses.

On the pre-test of the STAI, all State scores were higher than the same individuals' Trait scores. Additionally, the mean for the State portion of the pre-test was 9.2 points higher than the mean for the Trait portion. Because the pre-test was taken prior to a solo performance in front of a group of people, this finding indicates that all five participants were likely to have more anxiety prior to performance than they generally have during daily life.

On the post-test of the STAI, however, three State scores were lower than the same participant's Trait scores. This finding may indicate that at the end of the study, these three participants were better able to cope with performance anxiety than general anxiety. On the post-test, the mean for the State portion was only .6 points higher than it was for the Trait portion.

There were two participants whose post-test scores did not demonstrate this trend for the State portion to be lower than the Trait portion. Matt's post-test scores on both the State and Trait portions were the same. His pre-test and post test scores on the Trait portion of the anxiety inventory were exactly the same, indicating that his Trait anxiety level did not change over the course of the study. However, his post-

test score on the State portion was 13 points lower than his pre-test score. This indicates that his state anxiety was impacted more by the techniques used in the study than was his trait anxiety.

Stephen's State anxiety level did not seem to be affected as much by the techniques used in the study. His State score was higher than his Trait score on the post-test. His State portion only decreased by 3 points from pre-test to post-test, while the change in the other participants' scores ranged from 11 to 27 points. Interestingly, however, Stephen's Trait anxiety level decreased by 8 points. The fact that his Trait score decreased more than his State score on the post-test distinguishes Stephen from the rest of the participants.

One might expect that the participants who were playing the longer pieces would feel more anxiety prior to performance than the participants who were playing the shorter pieces. Although it might be expected that performance anxiety would increase according to the duration of one's piece, this factor did not seem to have an affect on these particular participants. Matt's piece took the most amount of time to play, and he had the lowest scores on both the pre-test and post test for the State portion. On the other hand, Stephen had a shorter piece than Harrison, Margaret, and Matt, and he had the highest score on the post-test for the State portion.

Personal Report of Confidence as a Performer (PRCP)

Four of the participants saw a reduction in their score on the Personal Report of Confidence as a Performer (PRCP) from pre-test to post-test. This finding indicates that for the majority of the participants, their level of performance anxiety was lowered and their level of confidence in their performance skills increased over the course of the study. The imagery and relaxation techniques used in the study were designed to help participants achieve more confidence and a more relaxed approach to performance.

The mean score among the five participants was reduced from 14 to 9. Harrison had the highest score on both the pre-test and post-test of the PRCP, but her score was lowered by six points on the post-test. Stephen and Annie had the lowest scores on the pre-test, but Stephen's score did not change from pre-test to post-test. The scores on the PRCP correlate with those of the STAI in their indication that Stephen's performance anxiety level did not change over the course of the study. Annie's score, however, went down by three points, giving her the lowest score on the post-test along with Margaret. Margaret's score changed the most from pre-test to post-test, with a decrease of nine points.

Interestingly, Harrison saw the greatest decrease in her score on both the State and Trait portions of the STAI, but her score on the post-test of the PRCP only decreased by six points. Harrison had the highest score on the post-test of the PRCP, while both Margaret and Matt saw a larger change from pre-test to post-test.

The PRCP and STAI therefore do not seem to correlate in the way that anxiety is measured. The questions on the PRCP are more closely aligned with the specific

elements of musical performance anxiety, while the questions on the STAI are related to general anxiety felt at the time of the test. When compared with Matt and Margaret, Harrison may have seen less of a decrease in her ability to deal specifically with musical performance anxiety.

Perception of Performance Change from Self-Report: Videotape Evaluations

The goal of the present study was to understand whether imagery, mental practice, and relaxation techniques may be used to enhance performance. The self-evaluations completed by the participants after watching their videotaped performances offer a basis for evaluation as to whether change occurred in satisfaction with performance level over the course of the study. These evaluations allowed the performers to judge their own playing with regard to personal standards and goals for the performance of the chosen piece at that stage of its mastery.

Areas that were individually rated by the participants were accuracy, concentration, memory, confidence, musicality, and overall performance. On the Videotape Evaluation (appendix F), subjects graded each of these six areas with a score from 1-10, with 1 representing the least satisfactory score and 10 representing the most satisfactory.

Subjectivity is an inherent part of judging a musical performance. It is impossible for an objective viewer to know the level of a performer's confidence or concentration. Therefore, the performer's own judgments of their performances were the sole evidence for whether their performance ability had increased. If their

performance evaluations improved over the course of the study, and if all five participants rated themselves more highly for Session Five than for Session One, then these ratings may be regarded as support for the idea that imagery, mental practice, and relaxation techniques may be used to enhance performance.

In the natural evolution of learning a piece, a musician is likely to become more comfortable with the piece, more confident, and more prepared as he or she continues to study, practice, and perform it on a regular basis. In the course of the four-week study, it was predicted that all of the participants would see improvement in their performance of their chosen piece. With regular performance and practice, the memory of the piece should become more stable and the performer's musical conception of the piece should develop. Additionally, it would be expected for the amount of anxiety to decrease as the performer becomes more comfortable and more prepared on the chosen piece. This expectation should be taken into account when examining the ratings on the Videotape Evaluations.

The effects of the study should not be negated, however, by assuming that the same improvement would be seen if the musicians were merely performing on a regular basis rather than participating in mental practice, imagery, and relaxation techniques. The comments from the videotape evaluations, practice logs, imagery exercise worksheets, final evaluation, and final interview will reveal that the subjects perceived the techniques used in the study as being highly effective. There was not a control group to compare with the participants in this study, so it is not possible to discern whether the same results would have occurred if the participants had merely engaged in weekly performances. However, the participants' comments reveal that

they felt more prepared, more confident, and had better concentration and a more solid memory at the end of the study. Since the study lasted only four weeks, one can compare their progress with that normally seen in a student who has performed once a week for a month. Generally, the same progress is not as readily apparent, especially in the area of arousal regulation and confidence.

Some questions in the Videotape Evaluation (appendix F) were designed to provide written commentary in addition to the numerical scores. The inclusion of the questions allowed for qualitative data and enabled the participants to explain their reasoning for the scoring. Some of these questions were intended to help the participants critically evaluate their performance. These questions, such as "What areas needed improvement?" and "What areas were especially good about your performance?" also made certain that the participants had actually watched the videotape.

One question was designed to help judge whether watching the videotape was an effective way to evaluate a performance. It asked "Did you notice anything in the videotape that you did not notice while playing?" This question assessed whether the participants would have evaluated themselves differently if they had relied on their memory of the performance. This finding is important because it answers the question of whether the study needed to use video recordings of performances rather than evaluations based on the memory of a performance. It also reveals whether watching videotaped performances can be seen as a learning experience.

Watching the videotape was viewed by the researcher as having two purposes: first, it provided a way for the performers to evaluate themselves objectively; and

secondly, the visual and aural model provided by watching a videotape of oneself could be regarded as a type of imagery. If the participants heard or saw something new by watching themselves on tape, then the vicarious learning experience could be transferred to the practice room and to the next performance.

If performers noticed negative aspects from the performance, either in sound, technique, or body movement, they could then begin to pay attention to those negative aspects so that they could be lessened or eliminated. On the other hand, noticing positive aspects of the performance could increase their confidence and help them either maintain those aspects of the performance or enhance them.

The following section consists of detailed descriptions of the individual Videotape Evaluations. Descriptions of each session include written commentary by the subjects as well as their performance rankings in each category of accuracy, concentration, memory, confidence, musicality, and overall performance. Following the description of each individual session, the mean scores in each category will be compared among the five sessions to evaluate whether there was any improvement in performance over the course of the study.

Session One

The performances at the first session took place prior to engaging in a progressive relaxation and imagery exercise. This setting allowed for an objective pre-test of performance ability and anxiety level before the participants were introduced to imagery and relaxation techniques. Subsequent performances in

Sessions II, III, IV, and V took place after the progressive relaxation and imagery exercise.

At Session I, prior to performing, the participants were given an introduction to the study and an explanation of what would be required of them as subjects. They also filled out the State/Trait Anxiety Inventories (STAI) found in appendix C and the Personal Report of Confidence as a Performer (PRCP) found in appendix D. In addition, they filled out a list of three goals that they wanted to meet by the end of the study on the List of Final Goals (appendix E).

The performance took place in a recital hall and the audience consisted of the researcher, five participants, and two other students who were considering participation in the study. One of those students signed an Informed Consent Form and performed a solo piece in front of the group, but later elected not to participate in the study. They performed in the following order: Matt, Harrison, Margaret, Stephen, the student who later withdrew from the study, and Annie.

The following table shows the participants' ratings of their videotaped performances during Session One. Each category was rated with a score from 1-10, with 1 representing the least satisfactory score and 10 representing the most satisfactory.

Table 2

Videotape Evaluation Ratings from Session One

	Accu-racy	Concen-tration	Mem-ory	Confi-dence	Musi-cality	Overall Performance	**Mean**
Matt	6	9	9	6	5	5	**6.67**
Stephen	6	6	10	7	6	6	**6.83**
Annie	8	5	6	7	6	6	**6.33**
Harrison	6	4	7	4	3	6	**5**
Margaret	2	2	2	2	4	2	**2.33**
Mean	**5.6**	**5.2**	**6.8**	**5.2**	**4.8**	**5**	**5.43**

The mean score among all five participants was 5.43, but there was a large range of 4.34 among the individuals' mean scores. Margaret's mean of 2.33 was much lower than the highest mean of 6.83, which belonged to Stephen. The means of the other four participants were not far apart; after Margaret, the lowest mean score was a 5. Mean scores were closely related to the overall performance scores. Margaret rated herself lowest in overall performance, with a score of two, but three participants gave themselves a 6 and Matt rated his performance a 5.

In the individual areas, memory was given the highest individual score of 10 by Stephen. Musicality had the lowest mean score of 4.8, and memory had the highest mean score of 6.8. The participants were performing their chosen pieces for each other for the first time during Session One, and although the pieces were memorized, they were not yet polished. In this early stage, when the piece had not undergone repeat performances, musicality may have been the area that still needed the most work even after the memorization stage had been completed.

At Session One, four of the five participants noticed something in the videotape that they did not notice during the performance; Stephen was the only

participant who did not see anything new. He stated that "It is almost exactly what I expected to see." The other participants, however, were surprised by what they saw and heard in the videotape. Matt wrote that "I look completely different than I remember. I immediately see and hear things I want to change." Although three of the four participants noticed negative issues in their playing, Harrison wrote that "overall, the performance did not appear on videotape as badly as it did in my head. Interesting!"

Three of the participants noticed physical issues such as posture or alignment that they were not aware of during the performance. Matt saw that his neck was bent forward. Both Annie and Margaret felt that their body movements looked stiff. Margaret said that "I need to loosen up, relax, and have more fun performing." She noted that her elbows and right hand wrist were locked and became aware of her bridge collapsing when her right hand was stretched. Although Margaret assigned a low rating to her performance, she did comment that "My tone was, at times, quite beautiful." She observed that she needed to be able to see the music "in my head" to support her memory of the piece.

Three participants wrote about musical issues that seemed different during observation of the performance. Matt thought that his pacing was rushed at times, and stated that he needed to "enjoy the sounds" more. Overall, he said, "I need more drama and color." Annie said that "The whole piece seemed louder and less interesting dynamically than I thought." Both Matt and Annie felt that the music seemed less energetic and dramatic on videotape than it did while they were performing.

An interesting comment from Annie was that she felt that she looked "disengaged" during the performance. In her evaluation, she wondered whether it was an

overadjustment from nerves. "Maybe I am trying to be overly calm—and therefore have lost some of my intensity and character." When performers are trying to control their anxiety, they sometimes lose the excitement of the performance, and Annie seems to have noticed that about herself at the first performance.

Harrison liked the energy in her performance. In comparing the videotape to her conception of the performance, she explained that "It sounded much faster than it did in my mind while I was playing it. Mistakes were not as huge as I thought they were. Dynamic range was much smaller than I perceived it to be." Harrison was the only participant who seemed to be more satisfied with her performance after watching the videotape. Harrison also had the highest score on all three pre-tests: the State and Trait portion of the State/Trait Anxiety Inventory and the Personal Report of Confidence as a Performer. It is possible that her feelings of anxiety were either caused or exacerbated by a negative perception of her own performances. If so, watching videotapes may be helpful for someone like Harrison by proving to her that the performances were more successful in reality than they were in her imagination.

In the weekly Practice Logs (appendix K), a question was included on Day One of each week which asked whether watching the videotape had any effect on the participants' physical practice. In Week One, three of the five participants said that watching the videotape of their last performance affected their practice session that day. Two participants left it blank; Stephen because he had not practiced over the weekend, and Margaret because she had not watched the videotape yet. She said that she had not gotten up the courage to watch it yet because she "really disliked" her performance during the previous week.

Two participants commented on how watching the videotape helped them to be more aware of musical issues. Harrison wrote that "I knew I could relax the tempo more in cadences and tricky spots, so I took the time to do that." Annie felt that "I was more aware of dynamic contrasts and generally being engaged in the music." Matt said that watching the videotape helped him to become more aware of his physical posture, stating that "I was conscious of the position of my head over my body."

After the performance had taken place, the participants were introduced to progressive relaxation and imagery. A rationale for the use of progressive relaxation was given and was followed by a thirty-minute progressive relaxation routine. The participants lay down on blankets on the stage of the recital hall and the lights in the hall were dimmed. The introductory routine enabled the participants to individually tense and relax sixteen muscle groups twice in sequential order. The muscle groups were dealt with in the following order: dominant hand and forearm; dominant biceps; nondominant hand and forearm; nondominant biceps; forehead; upper cheeks and nose; lower cheeks and jaws; neck and throat; chest, shoulders, and upper back; stomach; dominant thigh; dominant calf; dominant foot; nondominant thigh; nondominant calf; and nondominant foot.

All of the imagery exercises used in the group sessions were modified from those recommended by Richard Suinn as an introduction to using visuo-motor behavior rehearsal, or VMBR (Suinn 1994). In the imagery exercise at Session One, the participants individually selected two types of scenes: one to cue the relaxation response and one performance scene involving a successful event. The participants were asked to choose scenes which were familiar and had actually happened in the past. The relaxation

scene was supposed to be a location, activity, or event that was characterized by relaxation, such as taking a break from hiking to sit in the shade by a brook. The successful performance scene was also to be drawn from a real-life experience in which the participant had performed at his or her own personal best. They were asked to choose a performance where they felt especially focused, tension-free, or confident. Specific details about every aspect of the event were included in order to use all five senses in the imagery routine.

The introduction to imagery in Session One began with a visualization of the relaxation scene, which was repeated twice. This scene had two purposes: first, it served as an introduction to using imagery, and secondly, it helped to further the level of relaxation before engaging in the image of the successful performance scene. A transition was made into the successful performance scene and was followed by a repetition of the relaxation scene. Between each scene, participants were asked to take a moment for a "body scan" to assess whether there was tension remaining in any of their muscles. They were also asked to raise their hand when they were fully involved in the scene; the researcher waited until all hands were raised before transitioning into a different scene. The imagery routine for Session One took about eight to ten minutes to complete. The participants filled out the Imagery Exercise Worksheet for Session One (appendix J) after they were finished.

Session Two

Session Two took place in the studio of a member of the piano faculty. Participants performed in front of the researcher only, and the performance was again videotaped for later evaluation. Before performing, the participants went through a progressive relaxation exercise in which sixteen muscle groups were individually tensed and then relaxed (appendix H). The sixteen muscle groups were addressed in the same order as the previous session, but each group was tensed and relaxed only once. The progressive relaxation routine took about twenty minutes to complete. During the routine, the participants lay down on blankets on the floor of the studio and all lights were turned off except for a small lamp.

The participants then went through an imagery routine which incorporated the same relaxation scene and successful performance scene from the previous week's session. It also incorporated a new performance scene that was again individually chosen by the participants but did not involve a past experience. Instead, it was designed to match one of the goals that were chosen at the beginning of the study. For instance, if technique enhancement was an intended goal, then the new performance scene should have emphasized the ideal achievement of the technique that needed improvement. If a goal was better balance between the hands on a certain section of the piece, then that section of the piece should have been replayed with an appropriate balance between the hands. These scenes could have involved either a sequence of different parts of the piece or the repetition of a short section of the piece. The imagery exercise began with the relaxation scene, followed by the successful performance scene, the new performance scene, and finally a repetition of the successful performance scene. The participants

filled out the Imagery Exercise Worksheet for Session Two (appendix J) after they were finished. The imagery exercise took about ten minutes to complete. The most time was spent on the new performance scene in which participants were given about five minutes to mentally repeat the scene on their own.

After the progressive relaxation and imagery routine ended, the participants went out into the hall. One participant came in at a time to play individually in front of the researcher and the video camera. The participants went in order according to the length of their pieces; those with the shorter pieces played first. Annie played first, followed by Stephen, Harrison, Margaret, and Matt.

The following table shows the participants' ratings of their videotaped performances during Session Two.

Table 3

Videotape Evaluation Ratings from Session Two

	Accu-racy	Concen-tration	Mem-ory	Confi-dence	Musi-cality	Overall Performance	**Mean**
Matt	7	8	7	9	8	7	**7.67**
Stephen	9	9	10	8	7	8	**8.5**
Annie	7	6	8	7	5	7	**6.67**
Harrison	7	7	6	6	7	7	**6.67**
Margaret	6	7	5	6	7	7	**6.33**
Mean	**7.2**	**7.4**	**7.2**	**7.2**	**6.8**	**7.2**	**7.17**

During Session Two, Margaret's scores went up by a wide margin, so that there was a smaller range (1.34) among the mean scores for each individual. The mean score for the five participants in all six categories was 7.17, and the mean overall performance score was 7.2. Both the highest and lowest scores were

given for memory; again, Stephen gave himself the highest score of a 10 for memory, while Margaret gave herself the lowest score of a 5 in this area. Accuracy, confidence, and memory all had mean scores of 7.2. Musicality again had the lowest mean score with a 6.8, while concentration had the highest score of 7.4.

In the subject commentary part of the videotape evaluations, Stephen was again the only participant who did not notice anything in the videotape that he did not notice while playing. He did state that "The first thirteen measures were great. Dynamics and phrasing were what I wanted. This is the section of the piece I visualized before playing." In the imagery exercise for Session Two, the participants had created a "new performance scene" in which they imagined playing one section of their piece in an ideal way. That scene was chosen so that the participants could focus on one of the three final goals that they had devised during the first session. Stephen, who had focused on his goal of musicality in the opening measures of the Brahms Cappriccio, apparently felt that the imaging exercise had helped him in his subsequent performance.

Three of the participants commented on physical mannerisms or gestures that impacted their performance negatively. Matt observed that he had a stiff upper body from the shoulders up. He said that his head was still tilted forward, which he speculated was probably creating most of the tension in his neck. Margaret noticed that she might sit too close to the piano, which she stated might limit her arm movement.

Annie saw that when her piece "didn't go exactly as I wanted, I made a negative look on my face" as if she were "almost disapproving." From watching the videotape, she realized that facial expressions "really are important in conveying musical ideas and a sense of confidence." Annie seemed to have been unaware that she was even making a negative facial expression, but after seeing it on the videotape, she realized the importance of appearing confident.

Margaret rated her performance much more highly in Session Two when compared with Session One. Her overall performance score rose from a 2 to a 7. In assessing the positive changes, she wrote that "My arms looked better than last time. I felt freer and more sure of myself." She commented that "the piece had togetherness. The *pp* sections were beautiful, and the ending was magnificent." For someone who commented in her list of final goals that she wanted to work on feeling good about herself and knowing that she plays well, these types of insights seem like they could be very beneficial.

Harrison also wrote about some positive changes when compared with the first performance at Session One. She said that "I felt I had more control over the piece, that I controlled the tempo rather than the tempo controlling me." She also wrote that the right hand melody sounded at times "very ethereal, floating, exactly like I wanted it to."

Two of the participants commented in writing on how helpful it was to watch a videotape of their playing. Margaret stated that "It is so good to watch and hear myself!" Likewise Harrison wrote that "I think the videotape really helps me get a clear image of how my piece is coming across to the audience."

She also stated that "I sometimes feel I am responding to the videotape when I think I'm responding to the relaxation and imagery techniques, but I guess having a mental image of myself on the videotape is a type of imagery, too?" Combining the techniques of relaxation, imagery, and videotape-watching makes it difficult to assess which of the techniques is most effective. However, Harrison seems to have been responding in a positive way to the combined techniques by becoming more aware of how her performances were perceived by the audience.

During Week Two, two participants felt that watching the videotaped performance affected their practicing. Margaret had not watched the videotape yet. Harrison said that after watching the videotape, "I really focused on bringing my left hand out and quieting my right hand. I went through the piece and experimented with it." By bringing her insights from the videotape evaluation to the practice room, Harrison came up with new interpretive ideas and ways to practice.

Stephen said that it affected his practice session because "I knew what sounded good and what didn't. I could hear what came across in my playing and what needs to be brought out more." It is interesting that watching the videotape affected Stephen in this way because on the videotape evaluation, he indicated that he did not see anything new that he did not notice while playing. It is possible that although he did not notice anything new from the videotape, the act of watching it helped him to become generally more aware of his sound and his overall conception of the piece.

Session Three

The third session again took place in the same faculty member's studio. Prior to the performance, all five subjects went through a progressive relaxation exercise in which the number of muscle groups had been reduced to seven. In order to do this, some of the individual muscle groups were combined. The hand, lower arm, and biceps were combined so that the whole arm was tensed, with the dominant arm tensed before the nondominant arm; the forehead, upper cheeks, and nose were combined into the facial muscles; the chest, shoulders, upper back, and abdomen were combined; and the thigh, calf, and foot were combined so that the dominant leg was tensed before the nondominant leg. It took approximately fifteen minutes to complete the progressive relaxation exercise for Session Three.

The imagery exercise employed the same three scenes as the previous session: a relaxation scene, a successful performance scene, and a new performance scene to achieve a selected goal. During this session, however, the participants were given two minutes to initiate further relaxation on their own after going through the progressive relaxation exercise. They could choose between deep breathing, a relaxation scene, or focusing their awareness on the relaxation of certain muscles (appendix I). Three participants chose to use all three techniques, while Stephen used deep breathing and the relaxation of particular muscles and Harrison chose to use the relaxation scene. It took about ten minutes to complete the imagery exercise for Week Three.

At this performance, the participants performed for each other in groups of either two or three. Harrison, Margaret, and Matt were in the group that played

first, and Stephen and Annie were in the second group. The following table shows the participants' ratings of their videotaped performances during Session Three.

Table 4

Videotape Evaluation Ratings from Session Three

	Accu-racy	Concen-tration	Mem-ory	Confi-dence	Musi-cality	Overall Performance	**Mean**
Matt	9	10	10	9	8	9	**9.2**
Stephen	8	9	10	9	7	8	**8.5**
Annie	9	7	9	8	8	7	**8**
Harrison	5	3	4	5	3	5	**4.2**
Margaret	6	6	5	7	6	6	**6**
Mean	**7.4**	**7**	**7.6**	**7.6**	**6.4**	**7**	**7.18**

The mean overall performance score of 7 was the same in Session Two as it was in Session Three. The mean score for the five participants in all six categories was 7.18. However, there was a large range of 5 points among the means for the individual participants; Matt had the highest mean with a 9.2, while Harrison had the lowest mean of 4.2. The lowest scores belonged to Harrison, who rated both concentration and musicality a 3. Three categories were given an individual score of 10; Stephen again rated memory a 10, while Matt gave both concentration and memory this highest score.

Both memory and confidence had a mean of 7.6 which were the highest means for any of the categories, but memory had a much larger range of 6 when compared with a range of 4 for confidence. Musicality had the lowest rating with a mean of 6.4. In the first three sessions, musicality had the lowest mean rating.

The participants may have tended to rate themselves more harshly in this area, especially since the pieces were still in a somewhat early stage of learning.

At this point in the study, the mean rating for confidence had slowly risen from 5.2 in Session One to 7.2 in Session Two and finally to 7.6 in Session Three. It is to be expected that as the participants continued to perform the same piece each week in front of the same group of participants, they would grow more comfortable and therefore have less anxiety about the performance. Feelings of confidence are related to feelings of anxiety because generally, the more confident a person feels about his or her playing, the less anxious he or she will be during performance. The confidence ratings probably rose during each subsequent performance in part because the participants were regularly watching themselves on videotape, performing the same pieces every week, and were growing more comfortable playing in front of the other participants in the study. The participants may have also felt more confident as a result of using the imagery techniques.

Four of the participants in this session noticed something in the videotape that they did not notice while playing. For the first time in the study, Harrison did not notice anything new in the videotape. Matt noted that "My posture is getting better. I wasn't leaning my head forward the entire time." Although he noticed this physical improvement, he noticed some negative musical issues including the fact that that some places were too "loud and clear, especially accompaniment figures." Stephen saw that one section of the piece, measures 26-33, didn't come across as well as he thought it did.

Annie saw that "It looked like I felt pretty comfortable performing." Margaret, on the other hand, stated that "I am feeling more and more relaxed while playing but I still look stiff on tape. My body needs to look more at ease, more relaxed, more involved with the music. I want to look more like a dancer when I play." It was interesting to hear that there was a contrast between Margaret's internal feeling of relaxation and the way that she appeared on tape. There are two possible explanations for this dilemma: either Margaret was not truly as relaxed as she felt, and she therefore lacked awareness of the amount of tension in her body; or her appearance did not match with the true state of her body.

In describing the areas that needed improvement, Matt said that the double-note arpeggios were too "bright and clear" and the rhythm was sometimes out of control. Stephen cited particular spots that needed more of a melodic shape. Harrison rated her performance during Session Three lower than her previous performances, stating that "I had a really hard time concentrating because I was so distracted by my cold hands." She also said that "I got so distracted and basically gave up while I was playing. I stopped thinking about the music and just tried to finish the piece."

The participants were also asked to cite which areas were especially good about the performance. Matt said that the "overall mood" was better than in previous performances. Stephen felt that measures 64-71 of his piece were smoother than they were in Session Two, and Annie said that her Ginastera piece had more intensity and character than before, adding that the rhythm was driving.

One of Annie's comments from the previous week was that her performance lacked intensity and character, so her awareness after watching the videotape may have led to improvement in that area.

In commenting on what she noticed in the videotape that she had not noticed while playing, Annie said that "It seemed generally on the loud side to me—especially the beginning. I also heard a hint of a little out-of-control quality to it." In her performances Annie seemed to be trying to find an appropriate balance between two extreme qualities: on the one hand, being too controlled and too "disengaged" to the point where the music lacked drama and intensity, which is what happened during the first two performances; and on the other hand, having intensity, drama, and character but seeming to be out of control, which is what happened during the third performance.

During the third week of practice, three of the participants felt that watching the videotape affected their physical practice sessions. Stephen and Harrison said that watching the videotape did not affect their practice sessions. Interestingly, those were the only two participants whose practice sessions were affected by watching the videotape during the previous week. It is possible that they had grown accustomed to what they would notice in the videotape and already had become more aware of their sound and physical movements, so the videotaped performance did not provide any new information that they could take to the practice room.

The other three participants noticed musical issues in their playing that they were able to experiment with while practicing. Matt said that after watching

the videotape, he practiced his "trouble spots" which included being softer on the double note arpeggios. Similarly, Annie practiced playing more softly in soft sections of the piece. Margaret said that "I have been experimenting with different musical ideas and I don't like what I've heard. This is a major goal this week—to find a satisfactory interpretation." Watching the videotape seems to have provided her with a way to obtain feedback regarding new interpretive ideas.

Session Four

Session Four took place in the same location as the previous two sessions, in a faculty member's studio. Before playing, the subjects went through two progressive relaxation routines. In the first routine, four muscle groups were subsequently tensed and then relaxed. The left and right arms, hands, and biceps were combined into one group, as were the left and right upper leg, calf, and foot. The other two groups were the muscles of the face and neck and the muscles of the chest, shoulders, back, and abdomen.

After this procedure, the subjects went through the same order of the four muscle groups and practiced relaxing the muscle groups without tensing the muscle first. They were told to carefully focus their attention on the feelings of tension in a particular muscle group, and then recall the feelings associated with the release of that tension. This procedure is referred to as "relaxation with recall." Training in progressive relaxation is aimed at enabling the trainees to eventually be able to relax their muscles without tensing them first. For example,

the researcher began with the following instructions: "Focus all of your attention on the muscles of the arms and hands and very carefully identify any feelings of tightness or tension that might be present there now. Notice where this tension is and what it feels like. And now relax, just recalling what it was like when you released those muscles." Overall, the combination of the two types of progressive relaxation took about twenty minutes.

The imagery session following progressive relaxation did not consist of guided imagery. Instead, the participants were directed to visualize the positive end result of their performance followed by detailed mental practice of a specific part of their piece. This was referred to as their "pre-performance imagery routine." The positive end result of the performance included playing the last part of the piece, feeling very confident about the performance, and standing up to bow for the audience. For the detailed mental rehearsal, the participants could choose which part of the piece they wanted to rehearse; it could be a section that they wanted to play particularly well, a part that often caused them difficulty, or the beginning of the piece. The participants were asked to rehearse their "pre-performance imagery routine" the night before the final performance as well as right before the performance. The imagery routine took approximately five minutes.

After going through the progressive relaxation and imagery session, the participants performed for the entire group, including all five participants and the researcher. The following table shows the participants' ratings of their videotaped performances during Session Four.

Table 5

Videotape Evaluation Ratings from Session Four

	Accu-racy	Concen-tration	Mem-ory	Confi-dence	Musi-cality	Overall Performance	**Mean**
Matt	6	6	6	9	8	7	**7**
Stephen	7	10	10	9	8	8	**9**
Annie	7	8	10	9	9	7	**8.33**
Harrison	7	5	6	4	4	5	**5.17**
Margaret	6	7	6	8	6	6	**6.5**
Mean	**6.6**	**7.2**	**7.6**	**7.8**	**7**	**6.6**	**7.13**

The mean of the overall performance scores was 6.6, and the mean score for the five participants in all six categories was a 7.13. Confidence had the highest mean of any area with a 7.8. The mean scores for accuracy and overall performance were the lowest in any category, with a mean of 6.6 in both areas. This was the first session in which musicality did not have the lowest mean score. Perhaps it was the learning stage at which the performers' musical ideas had come across in the performance. Stephen gave himself a 10 for both concentration and memory, while Annie gave herself her first 10 for Memory. Harrison again had the lowest mean score of 5.17, but that was higher than the mean score for her previous performance, which was a 4.2.

Only one of the five participants in this session noticed something in the videotape that he did not notice while playing. Matt noticed that during some passages, his hands were "too far into the keys." He said that measures 14-22 of "Les jeux d'eaux à la Villa d'Este" needed lightening. The other participants did not notice anything new, which may be because they had already watched themselves perform the same piece during the three previous sessions. They may

have also become more aware of their sound, posture, and physical movements during the performance, so that the videotape gradually became less useful. One of the reasons for watching the videotapes in the first place was to increase the performers' self-awareness. Therefore, the fact that they were not noticing new details from the videotape during the fourth session may be seen as proof that the videotapes were beneficial.

Annie stated that "I felt like I may have been too relaxed. I've never had the problem of my hands not being together. It may have been because my body/mind was not completely alert." The participants all seemed to be very deeply relaxed after each relaxation and imagery session, and it did seem possible that the use of relaxation could impact a performance negatively. However, this was the only instance in which a participant seemed to feel "too relaxed."

All five participants were able to find parts of their pieces that still needed improvement. Stephen said that there were times in his piece when "playing with the tempo" would have made the performance better. He seemed to feel that the tempo was too strict and not flexible enough in certain areas. Annie was concerned with the fact that her hands were not together in measures 12-19 of the first movement of *Danzas Argentinas*. Harrison said that the area that needed the most work in her playing of Bach was concentration because she was allowing her "feelings" to get in the way of her performance. She also said that she would like to have exhibited more musicality.

In discussing the parts of the performance that were especially good, Matt said that the climax before the coda was very clear and exciting. Stephen stated that the

ending of his piece was paced well, and the melody there was prominent. Annie congratulated herself for not stopping after any "stumbles." Similarly, Harrison said that the best part of her performance was that she "kept going." Although she thought that her "feelings" got in the way of her performance, Harrison was able to make it through the piece while maintaining accuracy and a steady tempo.

Harrison said that "I think the videotape affects my playing more than anything. The impression of that really sticks in my mind." Margaret stated that watching the videotape helped her to feel more confident about her playing. She wrote, "I know I know this piece."

Session Five

The final performance in Session Five took place in a large recital hall at a Departmental Piano Recital. The participants performed in front of a large audience of more than twenty people which included piano majors at the University of Oklahoma and the piano faculty.

Prior to the performance, the participants and the researcher met on stage and went through the same type of progressive relaxation routine used during the previous week in which they employed "relaxation through recall" on four muscle groups. This type of relaxation involves paying attention to the muscle group and allowing it to relax without tensing it first. The participants then engaged in their own "pre-performance imagery routine," which included the end result of their performance followed by a detailed mental rehearsal of a specific part of the piece. The combined progressive

relaxation and imagery routine only lasted about fifteen minutes. Following the imagery and relaxation routine, the participants filled out post-tests of the State/Trait Anxiety Inventory (STAI) and the Personal Report of Confidence as a Performer (PRCP).

The participants played in the following order at the final recital: Harrison, Margaret, Annie, Stephen, and Matt. Another pianist who was not a participant in the study performed first on the recital program. The following table shows the participants' ratings of their videotaped performances during Session Five.

Table 6

Videotape Evaluation Ratings from Session Five

	Accu-racy	Concen-tration	Mem-ory	Confi-dence	Musi-cality	Overall Performance	**Mean**
Matt	9	10	10	9	8	9	**9.17**
Stephen	8	7	10	7	7	8	**7.83**
Annie	7	9	10	9	10	9	**9**
Harrison	6	5	6	5	6	6.5	**6.25**
Margaret	9	9	9	9	8	9	**8.83**
Mean	**7.8**	**8**	**9**	**7.8**	**7.8**	**8.3**	**8.12**

The participants stated that they were more nervous before the final performance because they felt more pressure than they had felt in previous performances. In explaining the amount of anxiety attached to the performance, they cited factors such as the size of the audience, the presence of the piano faculty, and the fact that they had worked for four weeks as participants of the study to get ready for this event.

Despite the amount of anxiety the performers felt, the mean for the overall performance scores was 8.3, which was higher than any of the previous performances.

The mean score among the five participants for all six categories was also higher than it was in the previous sessions. It had risen from the 7.13 in Session Four to an 8.12. Three participants gave themselves a score of 9 for their overall performance. Memory received the highest ratings, with the highest mean of 9 and three participants rating themselves a 10 in this area. Accuracy, confidence, and musicality all received the same mean score of 7.8.

In the written part of the videotape evaluation, all of the participants noticed something in the videotape that they did not notice while playing. Most of the comments indicated a positive reaction to the videotape, especially when compared to the participants' initial concept of the performance. Matt said that he seemed to move smoothly on tape, but it didn't feel as smooth while he was on stage. Annie gained a new perspective on her piece: "I've been playing this piece for so long that I've forgotten how discordant it sounds to the audience. It also looks interesting visually—which I've never noticed before."

Stephen wrote that "I looked much more relaxed than I felt." This comment is an interesting contrast to what Margaret wrote on her videotape evaluation of Session Three, which was that she felt relaxed but her body looked stiff. However, Stephen was probably referring more to his internal feelings of stress and anxiety rather than its representation as physical tension.

Stephen wrote: "I was not as focused while playing as I usually am. I couldn't really tell how well the performance went while I was playing, but it wasn't bad when I watched it on tape." This comment echoes Harrison's statement during her evaluation of Session One that her performance seemed better on tape than it did "in

her head." It is possible that Stephen was under more anxiety than usual, and therefore noticed for the first time the distinction between how he felt while playing for an audience and how he looked on videotape. He seemed to feel the same way as Harrison, who stated on her evaluation from Session Five that "I really enjoyed watching myself. Even though I was really nervous, I looked like I was enjoying the music."

Some of the negative aspects noticed by the performers included the following: Margaret said it looked like she was sitting too low and Harrison said that she still needed to improve on concentrating while under pressure.

In commenting on the areas that were good about the performances, Stephen said that "the pacing and tempo were good," adding that he usually speeds up when he is nervous. Annie noticed how quickly her fingers and hands were moving in certain parts. Margaret complimented herself by saying that "The last page was exquisite. I liked my timing, the musicality, the phrasing." Matt said that the piece had a strong beginning because "the main theme started particularly well; it created a colorful, flowing sound that started the piece well." Annie felt that her pacing was better than usual, adding that she "took plenty of time to be expressive." Her comments indicated that this performance was the first time that she was able to find a balance between intensity and control. Overall, Margaret said that "I was very happy about this performance and the improvement I've seen and heard over the last month."

Comparison of Scores among Different Sessions

In addition to analyzing the Videotape Evaluations from each individual session, it is necessary to compare the performance rankings across the five sessions in order to gain an understanding of performance change over the course of the study. The following charts demonstrate the change in scores from Session I to Session V in each area of accuracy, concentration, memory, confidence, musicality, overall performance, and the mean scores of all six categories.

Table 7

Ratings in Each Category from Session I to Session V

Table 7.1: Accuracy

	I	II	III	IV	V	*Change*
Matt	6	7	9	6	9	*3*
Stephen	6	9	8	7	8	*2*
Annie	8	7	9	7	7	*-1*
Harrison	6	7	5	7	6	*0*
Margaret	2	6	6	6	9	*7*
Mean	**5.6**	**7.2**	**7.4**	**6.6**	**7.8**	***2.2***

Table 7.2: Concentration

	I	II	III	IV	V	*Change*
Matt	9	8	10	6	10	*1*
Stephen	6	9	9	10	7	*1*
Annie	5	6	7	8	9	*4*
Harrison	4	7	3	5	5	*1*
Margaret	2	7	6	7	9	*7*
Mean	**5.2**	**7.4**	**7**	**7.2**	**8**	***2.8***

Table 7.3: Memory

	I	II	III	IV	V	*Change*
Matt	9	7	10	6	10	*1*
Stephen	10	10	10	10	10	*0*
Annie	6	8	9	10	9	*3*
Harrison	7	6	4	10	6	*-1*
Margaret	2	5	5	6	9	*7*
Mean	**6.8**	**7.2**	**7.6**	**8.4**	**8.8**	***2***

Table 7.4: Confidence

	I	II	III	IV	V	*Change*
Matt	6	9	9	9	9	*3*
Stephen	7	8	9	9	7	*0*
Annie	7	7	8	9	9	*2*
Harrison	4	6	5	4	5	*1*
Margaret	2	6	7	6	9	*7*
Mean	**5.2**	**7.2**	**7.6**	**7.4**	**7.8**	***2.6***

Table 7.5: Musicality

	I	II	III	IV	V	*Change*
Matt	5	8	8	8	8	*3*
Stephen	6	7	7	8	7	*1*
Annie	6	5	6	9	10	*4*
Harrison	3	7	3	4	6	*3*
Margaret	4	7	6	6	8	*4*
Mean	**4.8**	**6.8**	**6**	**7**	**7.8**	***3***

Table 7.6: Overall Performance

	I	II	III	IV	*V*	*Change*
Matt	5	7	9	7	9	*4*
Stephen	6	8	8	8	8	*2*
Annie	6	7	7	7	6.5	*.5*
Harrison	6	7	5	5	9	*3*
Margaret	2	7	6	6	9	*7*
Mean	**5**	**7.2**	**7**	**6.6**	**8.3**	***3.3***

Table 7.7: Means

	I	II	III	IV	V	*Change*
Matt	6.67	7.67	9.2	7	9.17	*2.5*
Stephen	6.83	8.5	8.5	9	7.83	*1*
Annie	6.33	6.67	8	8.33	9	*2.37*
Harrison	5	6.67	4.2	5.17	6.25	*1.25*
Margaret	2.33	6.33	6	6.5	8.83	*6.5*
Mean	**5.43**	**7.17**	**7.18**	**7.13**	**8.22**	***2.79***

In evaluating the results of the changes in scores over time, there is an obvious trend toward gradually higher ratings. Despite the increasing amount of pressure at each performance, performance evaluations showed generally higher scores at each subsequent performance. A comparison of the scores between Session I and Session V shows much higher rankings in the final performance in all six areas of accuracy, concentration, memory, confidence, musicality, and overall performance. The subjects also knew their pieces better because they had been practicing and performing those pieces over a longer period of time.

The greatest mean change over time was in the area of overall performance, with a mean difference of 3.3 from Session I to Session V. Margaret showed the greatest change in this area; her rating for the first performance was a 2, while her rating for the final performance was a 9, showing a difference of 7 points. She also showed the greatest change in mean scores which ranged from a 2.33 in Session I to an 8.83 in Session V.

Margaret saw the greatest mean change over time partly because she gave her first performance such a low rating. She seemed very disappointed after watching her first videotaped performance, and worked very hard to improve. She clearly perceived an improvement in her performance of the Chopin Nocturne over the course of the study. That may be because she gained confidence in her

skills, but it may also have been a natural evolution of performing the piece once a week. Margaret stated in the final interview that the study occurred at just the right time for her because she had just memorized her piece before the study began.

There may be another reason that Margaret showed more improvement than the other participants in the study. As her comments on the final evaluation showed, Margaret perceived the techniques used in the study as being very effective. Although her comments during Weeks One and Three on the Practice Logs indicated that she did not perceive the mental practice assignments during those weeks to be effective, she did generally seem to be enthusiastic about the techniques used in the study. Her verbal comments to the researcher indicated that she looked forward to the group relaxation and imagery sessions. Because she took the techniques used in the study seriously and felt that they would be effective, she may have perceived more improvement. On the other hand, her enthusiastic attitude may have enabled her to experience the true effectiveness of the techniques and therefore get more out of the study.

Stephen's scores changed the least from Session I to Session V. His mean score rose from a 6.83 to a 7.83 with a change of only one point. His overall performance score changed two points from a 6 to an 8. There are two possible reasons for the fact that Stephen's scores did not change much over time. First of all, Stephen's initial performance scores were very high; he had the highest mean rating for all five categories in Session One. He therefore may not have perceived as much of a need for improvement on his piece as the other subjects. Stephen

also stated at the final interview that he became bored with his piece after two or three weeks into the study because it was a short piece and he felt he had made the necessary progress on it.

Another reason for Stephen's scores changing less than the other members of the study may be that he did not perceive the techniques used in the study to be very effective. His ratings on the final evaluation and his comments on the practice logs indicated that he did not perceive the imagery, mental practice assignments, or relaxation techniques to be very effective. If the techniques were not perceived as being effective, then Stephen may have been less likely to put his full effort into them or rate his performance any differently over the course of the study.

The following scores did not change at all from Session I to Session V: Harrison's scores on accuracy were a 6 in both sessions (although they did go up to 7 at Sessions II and IV); Stephen's scores on confidence were at 7 in both sessions (although they did go up to 9 on Sessions III and IV); and Stephen's scores on memory remained at 10 during all five sessions. The level of confidence was raised for all of the participants except Stephen. His confidence may not have been affected as much by the techniques used in the study because he did not perceive them as being very effective. Obviously, his scores for memory did not get any higher because he started at Session I with the highest possible rating.

There were two negative changes in which the score at Session V was lower than the score at Session I, and both changes were by one point. Harrison's

rating on Memory was a 7 at Session I and lowered to a 6 at Session V, but it did get up to a 10 at Session IV. Harrison may have been more nervous at Session V and therefore her memory may have suffered more than it did in the initial session. That may have also affected the fact that her rating for Accuracy went up to a 7 at Session IV and went back to a 6 at Session V.

Annie's rating of Accuracy was an 8 at Session I, but was a 7 at Session V. The rating of 7 was her most common rating, but she did get up to a 9 at Session III. Annie said that she felt more nervous at Session V than at Session I, so her nervousness may have affected her accuracy. However, she also regarded herself as being less cautious or inhibited during her performance at Session V, so her involvement in the performance may have allowed her to take more risks and therefore have less accuracy. It might be argued that the energy and concentration present in her performance made it more successful even though it had more incorrect notes.

The following table demonstrates the change in scores between each session in the separate areas of accuracy, concentration, memory, confidence, musicality, and overall performance.

Table 8

	I	II	*I-II*	III	*II-III*	IV	*III-IV*	V	*IV-V*
Accuracy	5.6	7.2	*2*	7.4	*.2*	6.6	*-.8*	7.8	*1.2*

Concentration	5.2	7.4	*2.2*	7	*-.4*	7.2	*.2*	8	*.8*
Memory	6.8	7.2	*.4*	7.6	*.4*	8.4	*.8*	8.8	*.4*
Confidence	5.2	7.2	*2*	7.6	*.4*	7.4	*-.2*	7.8	*.4*
Musicality	4.8	6.8	*2*	6	*-.8*	7	*1*	7.8	*.8*
Overall Performance	5	7.2	*2.2*	7	*-.2*	6.6	*1.6*	8.3	*1.7*

The highest mean scores in every area occurred at Session V. The highest mean score occurred in the area of memory, with a mean of 8.8 at Session V. Memory was the only area in which the mean scores were higher at each subsequent session. Overall performance scores were also gradually higher at each session except for a decrease in .2 points from Session II to Session III. The highest positive changes between sessions were found between Sessions I and II; the mean scores on accuracy, concentration, confidence, musicality, and overall performance were each raised by more than 2 points. The greatest degrees of difference may have been found between Sessions I and II because participants performed for each other after engaging in progressive relaxation and imagery for the first time in Session II.

The change in scores from Session IV to Session V were all positive changes, with overall performance receiving the largest increase of 1.7 from Session IV to Session V. Because the largest change in the overall performance score occurred at Session V, it is possible that the level of arousal attained at the final performance may have been optimal for the performers. Although they complained about being nervous before the final performance, that extra excitement may have led them to perform with more concentration and energy. It

is also possible that the techniques used in the study were able to present their true effectiveness when tested in front of a larger audience.

Mean scores in all five categories gradually increased at each session, with the exception of some slight decreases. The most negative changes in mean scores were found between Sessions II and III, with concentration, musicality, and overall performance receiving lower scores by less than 1 point each. In the area of concentration, scores between Session II and Session III were lowered by .4 points. The mean score for musicality decreased slightly more by .8 points.

The main reason for the decrease seems to be the fact that Harrison gave her performance very low ratings at Session III. She had an illness that day and had difficulty concentrating at that performance, stating on her videotape evaluation that she "gave up and just tried to finish the piece." Harrison's mean score went from a 6.67 at Session II to a 4.2 at Session III. For the other participants, their mean scores were all the same or higher at Session III when compared with Session II except for Margaret, whose mean score was only .33 points lower at Session III.

Two areas had a slight decrease between Session III and Session IV. The mean score of confidence decreased by a .2 margin of difference, but accuracy saw the greatest decrease between Session III and Session IV, with a .8 point difference. These slight decreases should be analyzed with the understanding that only five participants were involved in the study, and there was sometimes a wide range among scores in one category. It is more helpful to examine the general

trend of the scores, which was that they generally became higher at every session and reached their highest in the final performance in Session V.

Progressive Relaxation and Imagery: Subject Perceptions of Efficacy

In order to assess whether the progressive relaxation and imagery exercises had any effect on the subjects' perceptions of performance enhancement, it is necessary to understand whether the subjects experienced the progressive relaxation and imagery exercises in a way that led to deep relaxation and clear, controlled imagery. It is also important to understand whether the subjects perceived these experiences as being useful.

In the Imagery Exercise Worksheets (appendix J) and Practice Logs (appendix K), subjects were asked to evaluate their perception of the effectiveness and usefulness of the progressive relaxation and imagery exercises. In the Imagery Exercise Worksheets, these evaluations were made both in written commentary and a numerical rating of the level of relaxation, imagery clarity, and imagery controllability. Imagery clarity is defined as the vividness of each aspect of the scene, including the visual, aural, kinesthetic, gustatory, and olfactory senses. Imagery controllability is the ability to control the scenes and stay focused on them. In addition, in the Practice Logs, participants answered "yes" or "no" as to whether the progressive relaxation exercises had any effect on their physical practice.

The following table shows the answers given in the Imagery Exercise Worksheets (appendix J) at each session of the study to the following three questions:

1. On a scale of 1-10, how well did the relaxation proceed?
2. On a scale of 1-10, how clear were the scenes?
3. On a scale of 1-10, how controlled were the scenes?

Table 9

Imagery Exercise Worksheet Numerical Ratings

Table 9.1: Session I

	Relaxation	Clarity	Controllability	Mean
Matt	8	7	8	
Stephen	9	7	8	
Annie	7	7	6	
Harrison	7	8	9	
Margaret	8	10	7	
Sum	39	39	38	
Mean	7.8	7.8	7.6	7.7

Table 9.2: Session II

	Relaxation	Clarity	Controllability	Mean
Matt	9	8	6	
Stephen	9	8	10	
Annie	8	9	8	
Harrison	7	6	6	
Margaret	9	9	7	
Sum	42	40	37	
Mean	8.4	8	7.4	7.9

Table 9.3: Session III

	Relaxation	Clarity	Controllability	Mean
Matt	10	10	9	
Stephen	9	9	10	
Annie	10	7	9	
Harrison	8	9	9	
Margaret	9	9	7	
Sum	46	44	44	
Mean	9.2	8.8	8.8	8.9

Table 9.4: Session IV

	Relaxation	Clarity	Controllability	Mean
Matt	10	9	10	
Stephen	8	9	9	
Annie	10	6	6	
Harrison	9	10	10	
Margaret	blank	9	9	
Sum	37	40	41	
Mean	9.25	8	8.2	8.5

Table 9.5: Session V

	Relaxation	Clarity	Controllability	Mean
Matt	9	9	10	
Stephen	5	8	9	
Annie	9	9	10	
Harrison	10	10	9.5	
Margaret	9	10	10	
Sum	42	45.5	49	
Mean	8.4	9.1	9.8	9.1

In all three categories of relaxation, imagery clarity, and imagery controllability, the subjects' ratings were always 5 or higher, with an average overall score of 8.4. These generally high scores indicate that the subjects perceived themselves to be very relaxed and have very clear and controlled imagery at every session. Even in the beginning sessions, before subjects had been trained in using progressive relaxation, they reported being very relaxed; the

numerical scores at Session I were at 7 or higher, and subject comments indicate that they were completely relaxed with perhaps one muscle group that maintained some tension. In Session I, before the participants had experienced being guided through an imagery routine, they reported through numerical ratings and comments on the worksheets that their images were both clear and controlled. The ratings were 7 or higher for imagery clarity and 6 or higher for imagery controllability.

Sport psychology manuals indicate that the clarity and controllability of imagery should improve with practice. It might be expected that because these participants were skilled in using imagery from the onset of the study, the subsequent imagery practice would not provide much improvement. However, a general trend can be seen in this chart in which the ratings gradually became higher as the study continued. The participant's mean scores were higher at Session V than they were at Session I, with Annie demonstrating a difference of 4 points in her self-report score for imagery controllability. This finding indicates that the participants perceived themselves to be more relaxed and have clearer and more controlled imagery at each subsequent session.

If the scores denoting their perception of relaxation and imagery are accurate, then the subjects improved over the course of the study in their abilities to relax more deeply and have clearer and more controlled imagery. This finding indicates that the subjects became more proficient at using progressive relaxation and guided imagery over the course of the four-week study. It is also possible

that the researcher gained skill in leading the participants through relaxation and imagery exercises.

The individual scores for relaxation, imagery controllability, and imagery clarity were added and divided by three to come up with a mean score for the given week. The lowest mean score of 7.73 was found in Session I, and the highest mean score of 9.1 was found in Session V.

Progressive Relaxation

During each of the five group sessions, the participants went through a progressive relaxation and imagery session led by the researcher. The first relaxation session lasted thirty minutes, but the progressive relaxation routine became shorter each week as the participants tensed and relaxed fewer muscles groups. Following the relaxation and imagery session, the participants filled out a worksheet in which they assessed their level of relaxation on a scale from 1 to 10, with 1 indicating that the participant was not relaxed at all and 10 indicating a state of deep relaxation.

Table 10

Relaxation Ratings by Participant per Session

	I	II	III	IV	V	***Mean***
Matt	8	9	10	10	9	***9.2***
Stephen	9	8	9	8	5	***7.8***
Annie	7	8	10	10	9	***8.8***
Harrison	7	7	8	9	10	***8.2***
Margaret	8	9	9	blank	9	***8.75***
Sum	39	42	46	37	42	***42.75***
Mean	**7.8**	**8.4**	**9.2**	**9.25**	**8.4**	***8.55***

In adding up all of the scores from all five sessions, the average score for relaxation was 8.55, which is higher than the average score for both imagery clarity and imagery controllability. There was not a large range between scores in this category; the lowest score belonged to Stephen, who had a mean of 7.8, and the highest score of 9.2 belonged to Matt.

Relaxation ratings rose gradually higher during each subsequent session. Edmund Jacobson (1929) stated that training in progressive relaxation leads to an increased ability to use the technique, which in turn enables further relaxation. In addition, training in progressive relaxation is intended to help people learn to decrease the amount of tension under which their body operates on an everyday basis (Bernstein and Borkovec 1973). With the ongoing progressive relaxation training, the participants became more proficient at relaxing their muscle groups and more aware of tense muscles so that they could relax them. In addition, the participants commented that they had become "conditioned" to relaxing at the sound of the researcher's voice.

However, during the final session, the mean score among the five participants was lowered from 9.25 to 8.4. That the subjects did not perceive themselves to feel relaxed at the final session is understandable, given the fact that they were about to perform in a recital situation under more pressure than they had felt during any of the previous performances.

In addition to the numerical ratings on relaxation, imagery clarity, and imagery controllability, subjects were asked specific questions about the imagery and relaxation exercises. The commentary from this portion of the Imagery

Exercise Worksheets (appendix J) provided a description of the way in which each individual experienced the relaxation and imagery exercises.

The first question on relaxation asked "Did your muscles feel completely relaxed?" Generally, the participants answered "Yes" to this question more often as the weeks continued. Matt wrote "Almost" for the first session, "Almost completely" at Session II, and "Yes" at Sessions III, IV, and V. Similarly, Harrison said "No" at Session I, "Mostly" at session II, and "Yes" in Sessions III, IV, and V. In fact, at Session V she wrote that she was very relaxed, "Almost in a hypnotic state." Margaret wrote "Yes" at every session except Session IV.

Two participants indicated that they felt less relaxed during the final imagery exercise at Session V. Annie said that she was relaxed "By the end" of Session I, but not immediately; that all of her muscles were relaxed at some point in Session II, but not constantly; "Yes" in Sessions III and IV, and "Almost" in Session V. Stephen wrote "Yes" for the first four sessions, but in Session V he wrote that he was "somewhat relaxed, but not as deeply as in previous sessions."

A second question related to relaxation asked "Did you have difficulty with a muscle group that remained tight?" Generally, the five participants seemed to have more trouble relaxing their upper body, including the shoulders, neck, and facial muscles. Two participants had trouble relaxing their jaw during the first two sessions, while Matt had trouble relaxing his neck. He commented on having tightness in the neck and shoulders during Session I. The tightness in his shoulders disappeared, but he again mentioned having tightness in his neck in Sessions II and V. During Sessions III and IV, Matt did not mention tension in

the neck area. It is possible that Matt learned to eliminate the tension in his neck, but it reappeared during Session V because of stress. During this session, Matt was facing the final performance for the present study and was also performing in his own solo recital two days later.

During Session III, the participants were asked to initiate further relaxation on their own after they had finished going through a progressive relaxation exercise. They could choose either deep breathing, the relaxation scene, focusing on the relaxation of particular muscles, or a combination of these three techniques to further enhance their level of relaxation prior to engaging in imagery rehearsal. They were given two minutes to initiate relaxation on their own, and were asked to raise their hand when they had reached an appropriate level of relaxation. Three participants chose to combine the three techniques, indicating that all three were perceived to be useful in enhancing relaxation. Harrison used the relaxation scene alone, while Stephen used both deep breathing and the relaxation of particular muscles.

In their individual practice during the week, the participants were able to move between the three stages of the Relaxation Exercises for Individual Practice (appendix L) on an individual basis. Participants were to rate their level of relaxation from -10 to +10 on each day of practice and move on to the next stage when they had reached a level of +7. The relaxation exercises were modified from those in *Seven Steps to Peak Performance*(Suinn 1986).

In Stage I of the relaxation, the participants were required to tense and then relax each muscle group twice. At Stage II, it was not necessary to tense the

muscle first; instead, the participants were asked to "flow relaxation into each muscle group." This type of relaxation is referred to as "relaxation with recall" and is the goal of progressive relaxation. Stage III consisted of merely visualizing each muscle group loosening up individually, and the participants were asked to try this in places other than a quiet room or with their eyes closed.

During the first week, all participants stayed in Stage I of the progressive relaxation exercise except for Margaret, who moved on to Stage II on the third day. All of the participants had moved on to Stage II on the first day of practice during Week Two. Four of the participants stayed in Stage II through the third week of the study except for Annie, who went on to Stage III on the second day of practice that week. Four of the five participants were in Stage III during the entire fourth week of the study, but Matt stayed in Stage II that week and never went on to Stage III. In general, the participants followed the relaxation exercises given in Stage I during the first week, Stage II during the second and third week, and Stage III during the fourth week of the study.

On the Practice Logs (appendix K), subjects also answered a question about the amount of time spent on progressive relaxation. In general, the participants gradually needed to spend less time on relaxation. At the beginning of the study, the shortest amount of time spent on relaxation was 10 minutes, and Stephen took up to 25 minutes. By the end of the study, however, Annie and Matt took about ten minutes a day, Margaret took five minutes on each day, and Harrison spent only 1-2 minutes each day.

Also included on the Practice Logs for Weeks Two and Three was a section in which participants were asked to "Rate your level of relaxation at the end of the session from 1-10, with 1 being extremely tense and 10 being extremely relaxed." The following table shows the participants' ratings of their level of relaxation on the practice logs for Weeks Two and Three.

Table 11

Relaxation Ratings from Practice Logs

	Week II, Day 1	Day 2	Day 3	**Mean: Week II**	Week III, Day 1	Day 2	Day 3	**Mean: Week III**	***Mean***
Matt	8	8	10	**7.67**	7	8	9	**8**	***8.33***
Stephen	9	6	7	**7.33**	9	8	9	**8.67**	***8***
Annie	8	8	7	**7.67**	8	9	9	**8.67**	***8.17***
Harrison	9	8	8	**8.33**	7	9	3	**6.33**	***7.33***
Margaret	7	7	5	**6.33**	8	9	10	**9**	***7.67***
Mean	8.2	7.4	7.4	**7.47**	7.8	8.6	8	**8.134**	***7.9***

In the individual practice sessions, the ratings for relaxation did not change significantly over Weeks Two and Three. The mean for the relaxation scores was slightly higher during Week Three than it was during Week Two, but the difference was not very large.

The relaxation ratings at the group sessions tended to be slightly higher than the relaxation ratings for the individual practice sessions. The mean relaxation rating during the group sessions for Week Two was 8.4, while for the individual practice sessions the mean was lower at 7.47. Similarly, the mean relaxation rating for Week Three's group session was a 9.2, but the mean rating for individual practice that week

was only an 8.13. Although the difference between these ratings is not very large, it is reasonable to assume that it would be easier to attain a higher level of relaxation during a group session in which the relaxation script was being read aloud. In fact, two subjects commented personally to the researcher that it would be easier to achieve relaxation by listening to a tape of the researcher's voice than by following written instructions.

Participants were also asked on the Practice Logs (appendix K) if the progressive relaxation exercise affected their practice in any way. The resounding answer on almost every day of practice during the five-week period was that the progressive relaxation exercises did indeed have an effect on physical practice.

During the first week, all participants answered "yes" to the question except for Stephen who answered "no" on the last two days of practice. Matt indicated that the relaxation exercises helped him to become more aware of tension as it crept into his playing so that he could start to relax those areas, especially in his neck. Margaret likewise said that she felt more relaxed and more aware of tension in her body. On the second day of practice, she said that "I was able to practice four hours… without any pain or soreness. I usually do feel it after practicing that much."

Harrison echoed these comments when she stated on the second day that "I began to notice tension in my feet while I was playing. It seems I have been gripping the floor with my feet." On the third day, she wrote that "Starting a practice session in a relaxed state helps me to notice tension from the onset, instead of noticing it after it has caused pain an hour later." Furthermore, Harrison wrote that "I felt like I could hear better. My ears seemed 'open,' and I listened better." Stephen said that he was

consciously thinking about relaxing while playing, and Annie noted that "I felt more at ease with my practicing. I wasn't stressed about having to accomplish a great deal."

The same kinds of comments were made during Week Two of the study. Margaret said that "I am more aware of where I hurt;" Matt said that he was able to detect and remove tension more quickly; and Harrison wrote that "I felt completely relaxed while I was playing today, my mind was so clear."

On the third week of the study, Matt made a slightly different comment after doing the progressive relaxation work. He said that he felt "more excited to play" and felt "energized." Margaret mentioned that "I am concentrating on relaxation while I play. I actually stop now in practice to relax muscles and focus on how my body is feeling." Harrison also grew more aware of the amount of tension in her body, stating that "I have been noticing tension now even if I didn't do progressive relaxation right before."

In summary, the progressive relaxation exercises helped most with enabling the participants to become more aware of tension. By gaining awareness and taking time during practice to eliminate that tension, the participants were able to practice for longer periods without pain. Harrison stated that by eliminating her muscular tension and beginning practice with a relaxed approach, her listening skills actually increased.

Imagery: Clarity and Controllability

The literature indicates that the effectiveness of imagery is enhanced when subjects have more clear and controlled imagery. Of these two factors,

controllability has been found to be more important as a factor in the usefulness of imagery. Before beginning to make a connection between performance enhancement and imagery, it is necessary to assess whether the subjects were engaging in effective imagery that was both clear and controlled.

In order to assess the level of imagery clarity and controllability perceived by the subjects during the group imagery sessions, the Imagery Exercise Worksheets (Appendix J) asked the subjects to rate their level of clarity and controllability with a score from 1 to 10. A score of 1 indicates very low clarity or controllability, while a score of 10 indicates imagery that is very clear or very controlled. Such a ranking demonstrates the level of clarity and controllability for each subject, and it may also show whether the clarity and controllability of the participants' imagings increased over the course of the study.

Imagery in Group Sessions

In each group session, the five participants went through a progressive relaxation routine led by the researcher which was always followed by an imagery exercise. During the first session, this relaxation and imagery activity took place after the performance. At the last four sessions, however, the performance always took place after the participants had gone through the relaxation and imagery routine. The imagery routines consisted of scenes which had been devised by the participants themselves on an individual basis. These scenes consisted of a relaxation scene to initiate relaxation and a successful performance scene, both of

which were based on a past experience in each participant's own life. They also chose a new performance scene which was designed to help the participant reach one of their final goals.

The imagery exercise for Session I included using a relaxation scene and a scene of a past successful performance. Participants were asked to describe these scenes on their Imagery Exercise Worksheet (appendix J). For the relaxation scene, four of the five participants described being outdoors; Matt was skiing in Switzerland, Annie was on a hiking trip in early morning, and Margaret and Harrison were sitting on a front porch. Stephen was sitting in a chair by the fire, reading a book. In regard to the successful performance scene, Matt and Annie chose a performance in which they were auditioning for entrance to a university. Margaret was playing for studio class, Harrison for a master class, and Stephen was playing in a joint recital with a vocalist.

The relaxation scene and successful performance scene were again used in the imagery exercise at Session II, but participants were also asked to come up with a new performance scene which would allow them to focus on one of their final goals for performance. Each participant chose to rehearse a specific section of their piece and described it in detail, connecting it to their final goal. Margaret and Annie chose confidence as their final goal. Harrison chose concentration as her final goal, and she focused on the beginning of the piece, asserting that "Concentration must start with the beginning of the piece." Musicality was the goal for Stephen and Matt. Matt wanted to have more of a focus on color, while Stephen wanted to work on balance and dynamics at the beginning of his piece.

During Session III, the participants again made us of the relaxation scene, which they repeated twice, followed by a visualization of the successful performance scene, the performance scene to achieve the final goals, and a final repeat of the successful performance scene. The only difference between Sessions II and III was the inclusion of an initial relaxation in which the participants chose between deep breathing, a relaxation scene, a focus on the release of tension in certain muscles, or a combination of these three activities.

The participants devised their own "pre-performance imagery routine" during Session IV which they were to use prior to the final performance in Session V. This pre-performance imagery routine consisted of the successful end result of the performance followed by a detailed mental rehearsal. For the detailed mental rehearsal, four of the participants chose to go over the beginning of their piece. In rehearsing the first part of their piece, each participant focused on a specific aspect of it, such as musicality, connecting to the audience, and feeling physically free. Under the heading of "musicality" the goals used were dynamic intensity, maintaining a steady accelerando, and a singing left hand. Harrison wanted "to focus on feeling comfortable during that awkward moment of silence after the audience stops clapping and before I start playing."

After finishing the relaxation and imagery routine, the participants filled out an Imagery Exercise Worksheet (appendix J) in which they rated the clarity and controllability of their imagery that day on a scale of 1-10. The following two tables indicate the scores given by each participant for imagery clarity and imagery controllability over the course of the study.

Table 12

Imagery Clarity Ratings by Participant per Session

	I	II	III	IV	V	***Mean***
Matt	7	8	10	9	9	***8.6***
Stephen	7	8	9	9	8	***8.2***
Annie	7	9	7	6	9	***7.6***
Harrison	8	6	9	10	9.5	***8.5***
Margaret	10	9	9	9	10	***9.4***
Sum	39	40	44	40	45.5	***42.3***
Mean	**7.8**	**8**	**8.8**	**8**	**9.1**	***8.46***

Margaret had the highest ratings for imagery clarity, while Annie had the lowest ratings in this category. Margaret's scores remained about the same over the course of the study. During the first week she gave herself a rating of 10 for imagery clarity, indicating that she already perceived her images to be very clear. Annie, on the other hand, gave herself a rating of 7 in Session I and although her score was raised to a 9 by Session V, she never perceived her imagery to be clear enough to score with a 10. Margaret may be more naturally skilled at using imagery, and the study may not have lasted long enough for Annie to become more proficient at using imagery.

It is impossible to assume that the scores represent actual differences in imagery ability, however, because a problem with the scoring system exists. The problem with this question is one that represents an inherent difficulty in studying mental practice and imagery. The type of clarity that Margaret may perceive to be a 10 might be perceived by Annie as a lower score. For that reason, it seems more relevant to compare each individual's scores between sessions rather than comparing scores among individuals. That way, one can gain an understanding of

whether the participants' perception of imagery clarity had increased or decreased over the course of the study.

The average score for imagery clarity over the entire study was 8.46. The mean score for all five participants rose at each subsequent session, with the exception of a slight decrease of .8 points from Session III to Session IV. The mean score at Session I was a 7.8, and the mean score at Session V was a 9.1, indicating a 1.3 point increase over the course of the study.

Table 13

Imagery Controllability Ratings by Participant per Session

	I	II	III	IV	V	***Mean***
Matt	8	6	9	10	10	***8.6***
Stephen	8	10	8	9	9	***8.8***
Annie	6	8	9	6	10	***7.8***
Harrison	9	6	9	10	10	***8.8***
Margaret	7	7	7	6	10	***7.4***
Sum	38	37	44	41	49	***41.4***
Mean	**7.6**	**7.4**	**8.8**	**8.2**	**9.8**	***8.28***

Stephen and Harrison had the highest scores in the category of imagery controllability, while Margaret had the lowest score in this category. This is a somewhat surprising finding, given the fact that Margaret had the highest score for imagery clarity. The difference between Margaret's scores on imagery clarity and imagery controllability indicate that there may not be a correlation between these two abilities. Given the fact that controllability is regarded as the more important factor in the effectiveness of imagery use, one would expect Stephen

and Harrison to attain the most positive results from the study. The range of scores for imagery controllability was not very large.

The mean score for imagery controllability during the entire study was 8.28, which was slightly lower than the mean score for imagery clarity. Again, the mean score in this category rose at each subsequent session, with the exception of a slight decrease of .6 points between Session III and Session IV. The average score in Session I was a 7.6, while the average score at Session V was a 9.8; there was a 2.2 point difference in ratings between Session I and Session V. There was a greater increase in the mean score for controllability than for clarity when comparing Session I with Session V. The mean score of 9.8 found in Session V was the highest mean score found in a single week for any of the three categories.

A question related to imagery clarity on the Imagery Exercise Worksheet asked "Did you recollect all of the sensory aspects of the initial scene—smell, sound, touch, taste, emotional state?" This question was meant to indicate imagery clarity, but it did not specifically ask about the level of clarity of the sensory aspects of the scene. Instead, it asked about how many senses were included in the imagery experience. Although the presence of all of the five senses is an important aspect of imagery, and is a factor in imagery clarity, it does not represent a true measure of imagery clarity. Indeed, for some participants it may have been difficult to evoke the gustatory or olfactory senses in a mental image. Even without the inclusion of these senses, one may experience very clear visual or auditory images.

During Session I, Margaret answered "Yes" to that question. Annie recalled the emotional state and the sound; she did not state whether the elements of sight, smell, and taste were missing from her image. Stephen recalled the visual and tactile sensory aspects most. Harrison said that the visual aspect was very vivid, and the sense of touch and the emotional state were also very clear. The smells and sounds in the image were not as clear for her. Matt recalled "maybe three or four things." In general, the participants seemed to have clear imagery even in the first session, even if all five senses were not included in the image.

During Session II, all of the participants gave very positive responses to that question, indicating that they had very clear imagery. Matt wrote that "nearly all aspects" were clear, and that "it gets better and better." Even after only one imagery session, Matt seemed to notice improvement in his ability to image. Harrison said that "I could smell, hear, and taste. I felt clear emotionally, and I could physically feel." Annie's relaxation was very clear and she wrote that "I felt the same peace and calm that I originally did in the mountains." For Stephen, the ideal performance scene and the performance scene from his particular piece were very clear, but the relaxation scene was not as clear.

The comments at Sessions III and IV were just as positive. At Session III, all of the participants again indicated that they had very clear imagery. Harrison wrote that "My relaxation scene is almost always clear, but today my successful performance was so clear it was scary." At Session IV, Stephen, Harrison, and

Margaret wrote that their imagery was very clear. Margaret even wrote that it was "Very clear—and very emotional. I found tears welling up in my eyes."

At Session V, all of the participants wrote that the imagery was clear. All of the participants answered "Yes" to this question, although two participants qualified that statement. Matt answered "Almost all," while Stephen wrote that "All aspects were there, but it was hard to focus on them for a long time." Stephen's comment was related more to imagery controllability than to imagery clarity. The comments given in Sessions III, IV, and V indicated that all participants had clear imagery. When compared with the comments given during the first session, the participants' abilities in imagery clarity, including the use of all five senses in imaging, seem to have improved.

A second question was related to imagery controllability. It asked "Were you able to 'hear' and 'see' yourself playing exactly as you did in your ideal performance, or were there specific details that sounded or looked a certain way in your imagery that you could not change?" In Session I, Stephen indicated that there were some things he could not change. Two other participants indicated that they had some control over the image, with Margaret stating that it was "harder for the performance scene."

In Session II, there were more positive answers to that question. Annie indicated that "I replicated those same feelings of confidence" and Stephen stated that "Everything happened when I wanted it to." Annie said that the images were mostly controlled, but that she "still felt a little uneasy as if it were a real performance."

The answers to this question at Session III were even more positive. Answers included the following statements: “Almost exact;” “They were exactly as they happened;” “I was in control of the images;” and “very clear and controlled today.” Margaret did write that she sometimes loses focus, and that self-doubt sometimes creeps into the images.

The reactions to this question at Session IV were more mixed. Interestingly, Annie said that “I think I was so relaxed (almost asleep) that I had a hard time concentrating,” and Margaret likewise said that she needed more concentration. Annie’s comment was very interesting because it indicates that extreme relaxation prior to imagery may actually be detrimental to the experience. Certainly, if a person were so relaxed that he or she were close to falling asleep, it would be very difficult to concentrate on an imaging task. Although some sport psychologists indicate that imagery is effective when used at night before falling asleep, perhaps it would be more appropriate to use imagery at a time of day when someone is able to relax easily but does not feel sleepy.

Harrison said that the imagery used in Session IV helped her to feel confident. Stephen stated that it was easy to control. Matt noted that he was “becoming better at these imagings,” indicating that he had witnessed his own progress in using imagery. This comment shows that regular imagery practice helped him to improve the quality and effectiveness of his own imagery.

Matt reasserted this statement at Session V by saying that “these have gotten easier and easier.” All participants felt that their imagery was controlled at Session V, with Annie adding that “I was able to make it sound how I wanted.”

Controllability is often cited as the most important quality necessary for imagery effectiveness. In order for imagery to be successful, the person doing the imaging must be able to control the senses evoked during the image so that she can manipulate these images into the ideal situation. Imagery is useful because it provides a rehearsal situation in which the practitioner has complete control. Because Annie was "able to make it sound like" she wanted, she had reached one of the major goals of the study.

It was interesting that although some of the relaxation scores were lower at Session V than they had been in previous sessions, especially for Stephen, all five participants had very clear imagery and were still able to control their imagery. It seems therefore that the quality of relaxation may not have an impact on one's ability to use clear and controlled imagery. All of the participants rated their imagery controllability with a 10 in Session V except for Stephen, who rated his only slightly lower with a 9.

A second question related to imagery controllability asked it there were any scenes that "drifted" or changed without the participants' conscious intent. In the first session, Matt had some distractions during the imagery while Margaret wavered between the two scenes. Annie, however, said that the scenes "seemed as I remembered them." Margaret said again in Session II that the relaxation scene sometimes shifted to other scenes. In Session III, Margaret mentioned again that she drifted between two of the images, and Stephen said that "Sometimes they faded more quickly than I would have liked, but it was easy to get them back." Matt's relaxation scene was very realistic during Session III,

however. He said that the scene "took on a life of its own" so that he was almost "reliving the moment."

In Sessions IV and V, all of the participants answered "No" to this question, indicating that they were able to stay focused on the image. The participants seemed able to stay focused more easily during the last two sessions, which indicates that their imagery controllability improved over the course of the study. Improvement in this area may have been a result of the weekly group practice and the individual imagery rehearsal.

Imagery in Individual Practice

In addition to the weekly imagery sessions, participants were also required to go through their own individual imagery practice routines during Weeks Two, Three, and Four of the study. They were asked to go through these routines after they had engaged in relaxation in either Stage I, II, or III. The relaxation and imagery techniques could be used either at night before going to sleep or before a physical practice session. To go through these routines, the subjects followed the instructions in the Imagery Exercises for Individual Practice (appendix M). The participants were required to work at the same stage of imagery during each week of the study. All participants were at Stage I during the second week of the study, Stage II during the third week, and Stage III during the fourth week.

During Week Two, the participants used the relaxation scene devised during the first session as a part of Stage I Imagery. Stage II Imagery, which was

used during the third week of the study, consisted of both the relaxation scene and the successful performance scene. The following table demonstrates subject ratings of imagery clarity during Weeks Two and Three of the study.

Table 14

Imagery Clarity Ratings from Practice Logs

	Week II, Day 1	Day 2	Day 3	**Mean: Week II**	Week III, Day 1	Day 2	Day 3	**Mean: Week III**	***Mean***
Matt	8	8	10	**7.67**	7	10	10	**9**	***8.83***
Stephen	8	5	7	**6.67**	8	7	7	**7.33**	***8.4***
Annie	9	8	6	**7.67**	7	9	9	**8.33**	***8***
Harrison	8	7	8	**7.67**	9	7	3	**6.33**	***7***
Margaret	7	7	5	**6.33**	7	8	9	**8**	***7.2***
Mean	8	7	7.2	**7.2**	7.6	8.2	7.6	**7.8**	***7.98***

The above chart illustrates the fact that the ratings for the clarity of imagery in individual practice sessions tended to become higher over the course of the study. However, the difference in the mean score between Week One and Week Two was small. In comparing the ratings for imagery clarity at the group sessions with those from individual practice, a difference can be seen during Week Two, but not during Week Three of the study. The mean score for imagery clarity at the third group session was an 8.8, which is higher than the mean score of 7.2 for individual practice during Week Two. However, the mean score of 7.8 for individual practice during Week Three was not much different than the mean score of 8 during the fourth group session.

Stage III Imagery allowed the subjects to personalize their imagery routine based on their final goals for performance. They could choose from the following four options: creating a "winning feeling" to enhance self-confidence; removing tension during a certain part of the piece; practicing a certain part of the piece for accuracy, musicality, solid memory, or character; or practicing trigger phrases or attitudes.

Both Annie and Harrison chose to create a "winning feeling" in their images during Week Four. Annie's final goal was musicality. In creating a key phrase to create the "winning feeling," Annie stated that "I had a hard time choosing a word or phrase to trigger the winning feeling. I thought about 'harmonious success' or 'triumphant success' or 'joyful success'—I wanted to choose something strong, but not too abrasive. I used 'triumphant success' in my imagery, but I like 'joyful success' too." On the third day of practice, she said that "there is a certain clarity that comes with the imaging that doesn't always happen in performance." She said that the imaging exercise affected her playing by making her feel more confident.

Harrison also chose to use the "winning feeling" imagery exercise. Her final goal for the visualization was concentration. In contrast to her playing, she said that during imagery, "I am calm throughout, never doubting myself. When I am performing, I'm always in inner conflict." She also felt that she had "more confidence" and felt excited about performing rather than nervous.

Harrison said that the imagery exercise affected her playing during the week. On the first day of practice, she had to perform that night, but said that she

started out her performance feeling "a little more calm than usual." Her second day of practice was also affected because she "had so much imagination, a good amount of confidence." On the third day of practice, she said that doing the imagery exercise before practicing made her "happier to play, more imaginative."

Margaret's final goal for the imagery exercise was confidence, but she chose to use the imagery exercise to remove tension. In comparing the imagery exercise to her current performances, she stated that "I feel totally relaxed when I play [my piece] in my head, but not when I play it for real." The imagery exercise affected her playing, she said, because it "Helps me to relax and just let the music happen without me forcing it." She also mentioned that after doing the imagery work, she "felt calmer and more focused" when she played.

Stephen chose to focus on attaining more accuracy in his playing. He commented that the imagery exercise helped him to feel "a little more confident with the notes." Matt chose to practice key phrases like "smooth and easy," "flowing," and "play like Liszt did." His final goal for the imagery exercise was a focus on color.

Matt stated that on each practice day, the imaging exercises affected his playing in several ways. On the first day, "my [cue] phrases helped me keep loose and create nice colors." He also "felt sort of disembodied like I do in the imaging; I was able to relax and let things happen." He also said that in his imaging exercises, he was able to zone out more easily and focus on the music in a way that he currently wasn't reaching in performance. He also had complete control of phrasing in the imagined performance.

Mental Practice

Between sessions, participants were assigned specific types of mental practice that were to be performed three times a week for 15- to 20-minute periods. After finishing the mental practice assignment, the participants filled out their Practice Log (appendix K) for the week. The Practice Logs included space for the participants to provide written commentary on each of the three days of mental practice. After going over the mental practice assignment, each participant was to answer questions in the logs regarding whether the mental practice affected his or her physical practice, understanding of the piece, and/or ability to play the piece.

On this section of the study, the individuals seemed to have very different perceptions of what types of mental practice were useful. There were not any generalized results that seemed to indicate that one type of mental practice was more effective than another. However, the participants did comment on the fact that the mental practice assignments were generally too long. They said that an optimal period of mental practice was only five minutes; after that period, they lost their concentration and often became frustrated.

Week One

There were three different assignments given during Week One for each day of mental practice. The mental practice assignments required the participants to "hear" the piece in their mind while reading over the score on the first day,

physically tapping the piece while reading the score on the second day, or visualizing the score on the third day. The following table indicates the participants' answers to questions regarding whether this type of mental practice affected their:

a. physical practice;

b. understanding of the piece; or

c. ability to play the piece.

Table 15

Mental Practice during Week One

	Day 1 a.	b.	c.	Day 2 a.	b.	c.	Day 3 a.	b.	c.
Matt	no	yes	yes	blank	blank	yes	yes	blank	blank
Stephen	blank	yes	blank	blank	yes	blank	yes	yes	no
Annie	no	yes	no	no	no	no	no	no	yes
Harrison	yes	yes	yes	yes	yes	yes	yes	yes	no
Margaret	yes	yes	yes	no	yes	yes	blank	blank	blank

The mental practice assignment for the first day of Week One was to read over the score while hearing it mentally. The participants were asked to "hear" the piece more than once depending on the length of the piece so that the total duration of mental practice was at least 15 minutes. They were also told to listen for something different each time that they went through the piece in their mind. In general, this type of mental practice seemed to affect the participants' understanding of the piece more than other areas. All five participants answered "yes" to the question of whether it affected their understanding of the piece on Day One.

The above chart does not show any other unanimous responses. It is especially difficult to make any assumptions based on the answers to these questions because some of the responses were left blank in the practice logs. It is assumed that the participants left the answers blank because they were not sure whether or not the mental practice affected these areas. For the most part, the participants did finish the assignment because they completed written commentary about it. However, occasionally during other weeks of the study, especially Week Three, at least one participant did not finish the assignment and left the answer blank for that reason.

Written commentary by the subjects did provide some insights into whether this type of mental practice was effective. On Day One of the practice logs, Harrison wrote that "I noticed new things in the score—voices and directions. I saw and heard new shapes, and it was easier to get a better idea of the big picture." Matt wrote that "I was able to focus on longer lines, my ears worked better. The piece felt less hectic and more flowing." Stephen said that "I knew more about exactly what I was listening for." Annie wrote that "I have a better understanding of the piece as a whole and the overall effect that I want."

The mental practice assignment for Day Two asked the subjects to read through the score while hearing it mentally and silently playing the piece using the correct fingering. Again, if this work took less than 15 minutes, the participants were asked to read through it more than once. They were also instructed to change the way that they heard different spots in the piece each time; for example, changing the phrasing or dynamic levels.

After this type of practice, Harrison wrote that "I could listen so much better! It was a rather surreal experience, especially when I started the piece. I found I understood deeper. My ability to play the piece was negatively affected in some areas and positively in others. Most of all, I was struck by the fact that the music kept going in my head, whether my fingers played the right notes or not." Margaret wrote that "Without the addition of the piano, I was able to concentrate on just the kinesthetic motions which helped me in memorization. Musically, it helps as well with no technique or instrument to get in the way." Stephen said that "When tapping my fingers, I could tell when my hands did not match up."

The practice assignment for Day Three was similar, because again the subjects were required to read through the score while hearing it in their mind. However, instead of physically tapping the piece, they were told to imagine how it would feel to play it, using the correct fingering. This type of practice helped Stephen to be "more aware of the form of the piece as well as what I wanted it to sound like." For Annie, it affected her memory of the music: "By practicing directly after picturing the piece, I had better memory because I could visualize the music and think ahead." Harrison stated that "As I listened in my head, I found spots I wanted to listen to more. When I started to play physically, I separated some voices so I could hear even better, which affected my understanding of the piece." Matt focused during this type of practice not only on using the correct fingering, but also on taking a more physically relaxed approach in certain areas. He stated that "I remembered areas in which my arms would tighten. Imagining a more relaxed approach to those spots helped me to play them."

Week Two

During Week Two of the study, participants were told to try to come up with new interpretive ideas during mental practice. The practice log told them that these ideas "may be related, for example, to the shape and direction of each phrase, timing and use of rubato, dynamic changes, the relative tension and repose within harmonic progressions, character and mood changes, and changes in articulation, dynamics, and tone." They were also asked to incorporate these ideas into their physical practice.

In addition to this general instruction, the participants were also given more specific mental practice assignments for each of the three days of mental practice. On the first day of practice, the directions stated that they were to mentally practice the piece without looking at the score, while imagining what the keys looked like under their fingers. On the second day of practice, the assignment was to mentally visualize the score, hearing it as they went along. The practice assignment for the third day was to write down three specific spots with which they were having more difficulty, and then use physical practice in combination with mental practice on the three difficult areas.

The following table shows their yes or no answers to questions about whether these types of mental practice affected their:

a. physical practice;

b. understanding of the piece; and/or

c. ability to play the piece.

Table 16

Mental Practice during Week Two

	Day 1 a.	b.	c.	Day 2 a.	b.	c.	Day 3 a.	b.	c.
Matt	yes	blank	blank	blank	yes	blank	yes	blank	blank
Stephen	yes	yes	no	no	no	no	no	yes	no
Annie	yes	no	yes	no	no	no	yes	no	no
Harrison	yes	yes	yes	yes	yes	yes	yes	yes	yes
Margaret	yes	yes	yes	blank	blank	blank	blank	blank	blank

Again, the amount of blank responses makes it difficult to make any strong assertions about the type of mental practice used and its effect on the above three areas. However, all five participants did answer "yes" to the question of whether the mental practice used on Day One affected their physical practice. The mental practice assignment on Day One of the second week of the study asked the participants to mentally practice the piece without looking at the score, while imagining what the keys look like under their fingers. Margaret wrote that this type of mental practice "gives me more confidence" because it tests her knowledge of the notes.

All five participants were able to come up with interpretive ideas for their piece during mental practice. Matt decided after "looking at changes in texture between sections" that he wanted "to make these transitions clearer and take more time there." Annie decided to have "more space between phrases and more of a character change between contrasting phrases." Harrison wrote that she "thought of some different ways of articulating that I want to experiment with as well as different ways of playing the cadences."

On Day Two, the subjects were asked to mentally visualize the score in their mind, hearing it as they went along. They were to do only one section at a time and go back to the score if there were a section where every note was not clear. Only two of the participants said that there were spots in the score that were not clear all the way through.

On the third day of mental practice, the participants were asked to write down three specific spots with which they were having difficulty. They were told to name the section or measure numbers and classify the problem as being primarily musical/interpretive; technical (physical difficulties); or related to memory. If the problem did not fit into any of these three categories, they were to mark "Other" and write in the problem. If the problem was technical, the participants were told to decide during physical practice what specific motions would help to play it perfectly. They were to then imagine going through those motions successfully during mental practice.

Matt said that he was having difficulty finding the right color with the pedal (a musical/interpretive problem), hearing all the notes clearly, and playing softly enough (both technical issues). He practiced by imagining his body, arms, and hands coordinating in a way to produce the perfect sound. After practicing this way, he said that he felt more confident in his approach. He said that this type of practice affected his physical practice, but not his understanding of the piece or his ability to play the piece.

Stephen had technical problems coordinating the hands and playing a difficult part with fast notes, and his musical difficulty was bringing out the melody. He

commented after practicing hearing them correctly in his head that "I still need to work more on these spots," indicating that this type of mental practice did not fully correct the problems. Although it did not affect his physical practice or ability to play the piece, he did indicate that it affected his understanding of the piece.

Annie had two musical/interpretive problems in her piece: having more of a "delicate, pleading" sound in one spot, and setting the mood in the beginning of the piece. She also stated that in one area, she needed to "concentrate and be prepared for that measure so that it doesn't sneak up on me." She isolated those areas and practiced them three times mentally while looking at the score and hearing them in her head exactly the way she wanted them to sound. She said that after practicing in this manner, "I had more clearly defined goals in my practicing. I knew which measures I wanted to work on and how I wanted them to sound." Like Matt, this type of practice affected her physical practice, but not her understanding of the piece or her ability to play the piece.

Harrison had two musical/interpretive issues that she worked on during mental practice: she could not decide on a left hand articulation, and there was one spot where she had not been able to decide on a musical approach. She mentally practiced by "listening" to different ways to articulate the left hand, and then she imitated them physically. She also imagined how a cello would group those notes. In addition, there was a technical issue in part of the piece where her fingers felt like they got "tangled up." For this problem, she mentally practiced one hand while physically playing the other, and then she physically played both.

This way of combining both mental and physical practice seemed very effective for Harrison. She said that it affected her physical practice, her understanding of the piece, and her ability to play the piece. She commented that "I *really* like this type of practice in specific areas of difficulty. I don't think it 'cured' me, but it did help and will hopefully eventually eliminate the trouble spots. This type of practice was especially useful for interpretive ideas."

Week Three

During Week Three, participants were instructed to perform detailed mental practice in which they were to imagine playing individual sections, starting at the last section of the piece. Without looking at the score, but visualizing the score in their mind, they were to start in the last section and play through it mentally; then start on the second-to-last section and play through it mentally; and so on until they had mentally played through the whole piece.

This type of mental practice seemed to be very frustrating for some of the participants. During the group session the following week, they commented verbally to the researcher that it was very difficult for them to concentrate for that length of time. In addition, they said that it even made them feel less confident because they realized that they did not know their piece as well as they thought they did. They said that it was difficult for them to concentrate for longer than five minutes when using mental practice alone.

The following chart demonstrates the participants' answers to the questions about whether this type of mental practice affected their:

a. physical practice;

b. understanding of the piece; or

c. ability to play the piece.

Table 17

Mental Practice during Week Three

	Day 1 a.	b.	c.	Day 2 a.	b.	c.	Day 3 a.	b.	c.
Matt	No	Yes	No	No	No	Yes	No	Yes	Yes
Stephen	Yes	Yes	No	Yes	No	No	No	No	No
Annie	Yes	No	No	No	No	No	No	No	Yes
Harrison	Yes	No	Yes	blank	blank	blank	blank	blank	blank
Margaret	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Stephen commented in writing that "the mental practice was difficult to do. It was hard not to get distracted while thinking of the music. I think that after spending so much effort on mental practice I was relieved to physically play the piece." On the third day of practice, he said that "I grew frustrated with the mental practice and didn't actually make it all the way through. I couldn't stay focused on the song long enough."

Harrison wrote a similar statement, saying that "It was very difficult and tiresome to do this type of mental practice. I thought it would help with my concentration when I physically played the piece, but I'm not so sure it did." On the second day of practice, she said that "I couldn't finish the mental practicing. I was unsuccessful at concentrating and I fell asleep." Additionally, on the third day she said

that “I keep thinking about everything I have to get done, and I frequently lose my place.”

In contrast to Harrison, Annie felt that this type of mental practice actually helped her concentration. She wrote that “I feel better able to concentrate while playing and know what I wish to achieve while playing.” Two other positive comments were made regarding this type of mental practice. Annie stated that “I realized that I needed to work on specific parts more because of the sectional mental practice. So I isolated these parts in my practice.” Matt wrote that “I was more secure in phrasing and direction” and “I know where I’m going and stumble less.”

Margaret did something a little different during her mental practice session. On the first day of practice, she said that “Today I took a lesson from Rubinstein. I put on a recording of him playing this… and played hands separately with him, hands together and then I ‘pantomimed’ playing along with him (no sound). It was great work and gave me a lot of ideas.” She then went through the piece section-by section as assigned.

Week Four

The participants designed their own mental practice routine during the fourth week of the study. They were asked to structure their mental practice according to what they thought would take them to their final goals. The following table demonstrates rather this type of mental practice affected their:

a. physical practice;

b. understanding of the piece; or

c. ability to play the piece.

Table 18

Mental Practice during Week Four

	Day 1 a.	b.	c.	Day 2 a.	b.	c.	Day 3 a.	b.	c.
Matt	No	Yes	No	No	No	Yes	No	Yes	Yes
Stephen	Yes	Yes	No	Yes	No	No	No	No	No
Annie	Yes	No	No	No	No	No	No	No	Yes
Harrison	Yes	No	Yes	blank	blank	blank	blank	blank	blank
Margaret	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

It might be expected that the participants would think that mental practice was more effective when they had chosen what type of practice to use. Interestingly, however, there were more "no" answers during Week Four than there were during the previous three weeks. Stephen and Annie in particular did not feel that the mental practice was effective; they said that mental practice did not affect their physical practice, understanding of the piece, or ability to play the piece. They may have been disenchanted and even frustrated with mental practice at this point in the study, since they had been using mental practice on a regular basis for four weeks in a row. Stephen and Annie may also have felt that they had already reaped all of the benefits from mental practice, and its effectiveness had therefore deteriorated. Indeed, at the final interview, both Annie and Stephen intimated that they began to feel bored with the mental practice techniques by the end of the study because of the short length

of their pieces and the amount of time they had already been working on those pieces. Margaret and Harrison, however, did react with many more "yes" answers on the Practice Logs for Week Four.

Stephen chose to watch his hands on the keys as he mentally played through the piece. He indicated that this type of mental practice affected neither his physical practice, understanding of the piece, or his ability to play the piece.

Annie decided to go through her piece section-by section on the first day of practice. After each section she asked herself how it went—what went well and what could have been better. If she felt it was necessary, she went back over a section to try to make it better. On the second day, she mentally practiced the piece very slowly by hearing it and seeing it on the keys. She wrote that this type of practice affected her ability to play the piece. Her third day of practice was similar, but she mentally played through it at the normal performance tempo.

Matt decided to do a type of mental practice in which he picked one section of the piece and imagined everything he did physically to play it. He then checked himself at the piano "to make sure I'm focused." On the first day, he felt more secure with his fingers and the notes, and on the second day, he felt that his memory had improved. During the first two days of practice, this affected only his ability to play the piece. On the third day of practice, he said it affected only his understanding of the piece.

Harrison did "spot work" by first imagining how she wanted to play the piece in her mind and then imitating it physically. She tried to "really mix this up with physical practice so it was continuous and not tiresome." She said that it made physical practice

easier and that it helped her musicality in some spots. She also felt that it was easy to come up with new ideas by using this type of mental practice. On each day of practice, Harrison indicated that it affected her understanding of the piece and her ability to play the piece. On the first and third days of practice, it also affected her physical practice.

Margaret visualized herself playing the piece in a "totally free, relaxed way." She commented that mentally practicing the whole piece helped her to check for both accuracy and musicality. She learned that "if I just let the music happen it sounds great. The minute I tense up and try to force, my musicality just isn't there." On the first and third days of practice, this way of mentally practicing affected her physical practice, understanding of the piece, and her ability to play the piece, but on the second day of practice, she said that it only affected her ability to play the piece.

The most effective types of mental practice during Week Three, according to comments by the participants, were those used by Harrison and Margaret. Margaret seemed to benefit from using mental practice to visualize herself playing through her entire piece without tension. Harrison combined mental and physical practice by first imagining how she wanted to play a certain spot and then trying to mimic that sound ideal with what she did at the piano. This type of practice helped her to maintain concentration and it also helped her to come up with new musical ideas.

Summary of Mental Practice

It is possible to attempt to assess which area was affected the most by mental practice by adding together the number of "yes" answers in the above four tables.

There was not a large difference, however, among the number of "yes" answers given in each category. Participants answered "yes" to the question of whether mental practice influenced their physical practice 25 times. The answer "yes" was given 28 times when participants were asked if the mental practice affected their ability to play the piece. They also answered "yes" 28 times when asked whether it affected their understanding of the piece. In summary, mental practice seemed to affect their understanding of their pieces to the same extent as it affected their ability to play the pieces.

The number of "yes" responses given during each of the weeks of the study is as follows. During Week One, participants responded with a "no" eleven times and with a "yes" 23 times. Eleven responses were left blank. The responses for Week Two consisted of 12 "no" answers and 21 "yes" answers, with twelve responses being left blank. During Week Three, participants responded with a "yes" 18 times and with a "no" 19 times. Six responses were left blank that week; these were left blank by Harrison, who was not able to finish the mental practice assignment. The responses for Week Four consisted of 25 "no" answers and 19 "yes" answers, and no responses were left blank.

The most successful week therefore seemed to be Week One, when the participants heard the score in their mind while either reading over the score, tapping their fingers, or visualizing the score. It is possible that the participants had a more positive outlook on the study during the first week when the techniques were new; at that point, they had not gotten tired of using them or bored with their chosen piece. Written comments by the participants seemed to echo this finding. In general, the

comments were more positive and enthusiastic after the first week of mental practice than they were during the subsequent weeks.

There also seemed to be a large degree of difference among participants in how effective they felt the mental practice sessions were. Each participant gave a different number of "yes" responses when asked how effective mental practice was with regard to physical practice, an understanding of one's piece, and the ability to play one's piece. The number of "yes" responses are as follows: Harrison answered "yes" 27 times; Margaret, 24 times; Matt, 14 times; Stephen, 10 times; and Annie, 8 times. These numbers seem to indicate that Harrison and Margaret viewed mental practice as being highly effective, while Stephen and Annie viewed it as being less effective.

A number of factors may be taken into consideration when looking at this range of scores. First, the numbers show only the subjects' perception of the effectiveness of mental practice. Some subjects may have believed more in the possibility that mental practice is a useful technique, while others may have entered the study with the conception that it is not very helpful.

One may also take into account that all of the participants' pieces were different lengths, were written in different styles, and presented different difficulties. In addition, the participants entered the study at different stages in their learning of the chosen piece. Stephen and Annie both had relatively short pieces which were approximately three minutes in duration and they had been working on their pieces for a long time. During the final interview, they both mentioned feeling bored with the mental practice techniques because their pieces were so short and they felt like

they had reached a stage where they could not improve on their performance of the piece.

Harrison and Margaret, on the other hand, had just finished memorizing their pieces before the study began. Their pieces were a little bit longer than the pieces played by Stephen and Annie. Harrison and Margaret's pieces lasted six or seven minutes, while the pieces played by Stephen and Annie lasted about three minutes. Both subjects said at the final evaluation that they came into the study at the "perfect stage" because they had learned and memorized the notes but were ready to begin polishing the piece and paying attention to smaller details. Feeling less bored with the mental practice techniques may have helped these two subjects to approach the mental practice with a more positive mindset, and may have influenced their perception of the effectiveness of the techniques.

Some of the participants seemed to think that mental practice was more influential in a certain area. Stephen, for instance, responded with a "yes" four times when asked if mental practice affected his physical practice and six times when asked if it affected his understanding of the piece, but he never answered "yes" to the question of whether it affected his ability to play the piece. However, Stephen's piece was polished and technically fluent from the onset of the study. Therefore, his "ability to play the piece" may not have needed improvement.

On the other hand, Harrison and Margaret gave about the same number of "yes" responses in each of the three categories. Matt answered "yes" to the question of whether mental practice affected his ability to play the piece seven times, which was slightly more often than the five times that he felt it affected his understanding of

the piece. He only said three times that it affected his physical practice. Similarly, Annie also indicated that mental practice affected her ability to play the piece more than her physical practice or her understanding of the piece.

Subject Perceptions of Efficacy

The purpose of the present study was to assess the usefulness of relaxation, mental practice, and imagery techniques in performance enhancement. In addition to the use of videotape evaluations to judge performance change and statistical tests to measure anxiety reduction, it was also important to understand the subjects' perceptions of the usefulness of the techniques. For that reason, there was a question included on each week of the mental practice logs that allowed the participants to rate their perception of the overall efficacy of the techniques used at that stage of the study. These ratings may be examined by coming up with a mean score from all four weeks and by examining whether the ratings changed over the course of the study.

In addition, the researcher examined the subjects' perception of the efficacy of the techniques used in the study by having the participants fill out a written Final Evaluation (appendix N) and by conducting a final interview with all five performers after the final performance had concluded.

Mental Practice Logs

On the Practice Logs (appendix K), participants were asked at the end of each week to rate their perception of the overall efficacy of using relaxation techniques and mental practice at that stage of the study. These ratings were based on a scale of 1 to 10 with 10 being very effective and 1 being not effective at all. The table below demonstrates the ratings given by each participant after each week of the study.

Table 19

Subject Ratings of Efficacy

	Week One	Week Two	Week Three	Week Four	**Mean**
Matt	6	7	8	7	**7**
Stephen	5	4	7	7	**5.75**
Annie	6	8	9	8	**7.75**
Harrison	7	7.5	4	9	**6.88**
Margaret	3	blank	9	9	**7**
Mean	**5.4**	**6.63**	**7.4**	**8**	**6.88**

The mean score became gradually higher on each week of the study. A general trend was for each subject's perception of effectiveness to gradually increase over the course of the study, as well. The highest mean rating for effectiveness was found on the final week of the study, with a mean score of 8, indicating a high perception of effectiveness for the mental practice, imagery, and relaxation techniques. It is interesting that the efficacy ratings increased over time because the participants' enthusiasm for mental practice seemed to decrease over the course of the study. It is possible that although some of the participants were becoming more frustrated with

mental practice, they were gaining an appreciation for other techniques in the study such as imagery.

Final Evaluation

After the final performance at Session V was over, all five participants filled out a Final Evaluation (appendix N) to discern their perception of the overall effectiveness of the study and what aspects were considered to be most beneficial in the areas of confidence, memory, concentration, and arousal regulation. For each question, the participants were asked to mark which technique or techniques they regarded as affecting the particular area: mental practice, imagery, relaxation training, watching videotapes of performances, and performing each week in the sessions. The participants could mark as many factors as they believed to have affected that area.

The first question was related to arousal regulation. It asked the subjects "Did you feel more anxious or less anxious than you did in your first performance at Session One?" Four participants said that they felt more anxious at the final performance. They stated that the reasons for feeling more anxious were that the performance was more formal, there was more pressure, there was a larger audience, and it took place in a recital setting. The presence of the piano faculty also added a certain amount of pressure. One participant had a recital coming up the next weekend and said that he was more anxious because of the performance's close proximity to his recital.

Margaret was the only participant who felt less anxious at the final session; she said that her decrease in anxiety was due to mental practice, imagery, relaxation

training, watching videotapes of performances, and performing each week in the sessions. Interestingly, although four of the participants said that they were more anxious at the final performance, the State portion of the State/Trait Anxiety Inventory (STAI) indicated that the state anxiety level was actually lower for all five participants on the post-test. Perhaps the participants were better able to cope with the anxiety after they had gone through the techniques used in the study, even though they felt that they were under more pressure.

The second question asked "Did you feel more confident or less confident than you did in your first performance at Session I?" All five participants felt more confident. Imagery and performing each week in the sessions received the highest scores for their impact on the performers' confidence, with each of those two categories receiving four votes. Mental practice and watching videotapes of the performances received three votes each for their influence on confidence, and two people said that the change in confidence was due to the relaxation training.

The third question asked if the subjects felt more prepared or less prepared than they did in their first performance at Session I. All five participants indicated that they felt more prepared. The highest scores in this category were given to mental practice, imagery, and watching videotapes of previous performances, with each of these areas receiving four votes each. Three people said it was due to performing each week in the sessions, while only one person said it was due to relaxation training.

The fourth question was related to stability of memory. It asked "Did you feel that your memory was more or less stable than it was in your first performance at Session I?" Memory had a lower rating than both confidence and feeling prepared.

Two people said that their memory was more stable, while three people said that it was the same as in the first session.

Given the fact that memory generally had high ratings at the first videotaped performance, this finding may indicate that some of the participants did not need additional work in solidifying their memory of their piece. No one said that the stability of their memory was lower than it was in the first session. For the participants whose memory did improve, mental practice and performing each week in the sessions were given the highest number of votes for their influence in this area. They were given two votes each, while imagery, relaxation techniques, and watching videotapes of previous performances were given one vote each.

A fifth question asked the participants if they felt that their concentration level was higher or lower than it was in their first performance. Three people said that their concentration level was higher, Stephen said it was the same in both performances, and Harrison said it was lower than in the first performance. She stated that her concentration level was lower because she felt a greater amount of pressure in the final performance due to the larger audience. Of the participants whose concentration level increased, mental practice was given the most votes for its impact on concentration. Mental practice had three votes compared with two votes for imagery and one vote each for relaxation training, watching videotapes of performances, and performing each week in the sessions.

The sixth question was designed to assess which technique was regarded as being the most effective part of the study: imagery, mental practice, or relaxation techniques. It asked "Which of the following three factors influenced your final

performance the most?" Participants could only mark one of the three factors, or they could leave the answer blank to indicate that none of those three techniques had been useful.

Imagery and mental practice received an equal number of votes. Two people were influenced most by mental practice, while two other people were influenced most by imagery. No one was influenced most by the use of relaxation techniques. Stephen said that none of those three factors affected the final performance. Because Stephen had indicated that his self-confidence had increased over the course of the study, it is possible that the change in this area was due to either the use of videotapes or the weekly performances, neither of which was listed on this question.

A seventh question was designed to assess which of the following five areas were influenced most by the use of relaxation techniques, mental practice, and imagery: self-confidence, arousal regulation, relaxation techniques, concentration, or memory. They could name only one of those factors, or they could leave it blank to indicate that none of the areas were influenced by the techniques.

The area that was influenced the most was self-confidence. Three of the participants said that their self-confidence increased over the course of the study and that self-confidence was the area that was influenced most. The other two participants included Matt, who named as his most-influenced area an increase in the ability to concentrate and Harrison, who claimed a reduction in anxiety.

The two participants whose final performance seemed to be most affected by the techniques used in the study were Annie and Margaret. Margaret was the only participant who felt less anxious during the final performance. She also felt more

confident, more prepared, and had a more stable memory and a higher concentration level. For each of these areas, she marked all of the techniques as being beneficial: imagery, mental practice, relaxation training, watching videotapes, and performing each week in the sessions. She named mental practice as having the biggest influence on performance change over the course of the study, and she said that her self-confidence was influenced the most by the techniques used in the study.

Annie felt more confident, more prepared, had a higher concentration level, and more stable memory during the final performance. She named mental practice as being the factor that influenced her final performance the most, and she said that the area that was affected the most by the techniques was self-confidence. She stated that her feelings of confidence were improved through the use of mental practice, imagery, and performing each week in the sessions. Her memory was improved by the use of mental practice and performing each week in the sessions, and her higher concentration level was due to both mental practice and imagery.

Harrison felt more prepared and more confident during the final performance. She stated that imagery and relaxation training helped her to become more confident, while mental practice and watching videotapes helped her to feel more prepared. The factor that influenced her final performance the most was imagery, and the area that was influenced the most was anxiety.

Matt felt more confident, more prepared, and had higher concentration during the final performance. He regarded imagery as being the most influential factor in the study, and he said that his concentration level was influenced the most by the techniques used in the study. He said that mental practice, imagery,

and watching videotapes helped with confidence and preparation, while mental practice and performing each week in the sessions helped with concentration.

Stephen perceived the techniques used in the study as being less effective. Of the three techniques of mental practice, imagery, and relaxation training, he did not name any of those three factors as being influential. He did think that it was effective to watch videotapes and perform each week in the sessions, however. He said that he felt more confident and more prepared during the final performance, and he said that watching videotapes and performing each week in the sessions were the techniques that affected his feelings of confidence and preparation. For Stephen, self-confidence was the area that was influenced most by the study.

The participants were also asked to look over the three goals that they had listed at the beginning of the study and determine which, if any, of those goals had been met. Musicality was the most often-mentioned goal that was met over the course of the study, and was named by three participants. Annie's musical goals for more dynamic contrast and intensity were met. Harrison wrote that "I played more musically than before, but I feel I could do more." Margaret wrote that her goals of having a more solid memory, more confidence, and musicality were all met. Matt said that his hands were more relaxed in the introductory passages, and Stephen stated that his goals of accuracy and technical fluency were both met.

Finally, the participants were asked to rate the overall effectiveness of all aspects of the relaxation training, imagery, and mental practice techniques in enhancing their performance ability. They were to use numbers from 1 to 10, with 1 meaning not effective at all, and 10 meaning very effective. The scores

were 10, 7, 7, 7.5, and 7. The mode for these scores was 7, and the mean score was a 7.7. Overall, these ratings indicate that the participants seemed to regard the techniques used in the study as being quite effective. Harrison made an additional comment after she filled in her score of 7.5. She wrote that "this indicates short-term. I believe wholeheartedly in the effectiveness of the training, and I did make progress. I felt that to really see long-term results I will have to keep working."

Overall, the final evaluation showed that the techniques used in the study were most effective in the areas of confidence and helping the participants to feel more prepared. These two factors are obviously related to each other. All five participants felt more confident and more prepared at the final performance. Both memory and anxiety were not perceived by the participants as having been affected as much by the techniques used in the study.

Imagery and mental practice were the techniques that received the highest ratings for being useful. They received two votes each on the question that asked which factor influenced the final performance the most, and they also received more votes than the other categories on the first five questions of the evaluation. Imagery and mental practice received thirteen votes each on these questions, while performing each week in the sessions received eleven votes, watching videotapes of the performances received ten votes, and relaxation training received only seven votes. Relaxation training may have received the least number of votes because it was not regarded as an individual technique, but rather as a part of the imagery process. Rather than being seen as beneficial when used alone, the relaxation techniques were

seen as an aid for imagery to help associate the imagined performance with a state of calm and relaxation.

Final Interview

After the final performance was over and the participants had filled out their Final Evaluations (appendix M), the researcher met with all five participants to conduct a final interview. The interview gave the participants an opportunity to openly discuss how they felt about the study, whether it was effective and what parts of it were the most beneficial, and if there were any aspects of the study that they would have changed. The interview was recorded on audiotape.

The interview opened with the researcher asking if there were any general comments that the participants wanted to share. Immediately, all five participants began talking about how they felt that the most effective aspect of the study was its collaborative nature. Matt began by stating that it was very encouraging to work together as a group, adding that it was helpful to share that experience and know that everyone was going through the same thing. Margaret agreed, stating that "the piano is such a solitary instrument." She said that she felt supported by everyone in the group, and Harrison agreed, saying, "We felt like a team."

Additionally, working with other people on techniques like mental practice and imagery helped because it enabled the participants to discuss the techniques with each other. Harrison said that "It's always been sort of a struggle for me, I mean I don't think I've ever not felt nervous. I've read books about it and done a lot of work on my

own, but it was nice to constantly think about it and talk about it." She said that "I saw progress. And yes, I was still nervous before playing, but I feel like it helped what we did."

The participants also agreed that it was helpful to all sit together as a group during the final performance because they felt comforted by the presence of other members of the group. Margaret said "It felt good somehow to have you all near me. I found it comforting… it was easier to get up and play and be together, in a weird way." Harrison agreed, saying that it was "because we'd all laid down together." Although Harrison was joking, they did seem to feel that there was a bonding experience that happened when they went through the progressive relaxation and imagery routines together.

When asked if this experience was different than the act of performing as a group in weekly performance classes, all five participants nodded. Margaret said, "Because we had to do different things. Rather than just play for each other, we actually 'woke up together.'" She laughed after saying this, and Matt agreed.

Annie also mentioned that the participants knew all along with whom they were going to be performing, and that made the final performance seem less stressful. Margaret agreed, saying "we knew right from the beginning what it was going to be." Having prior knowledge about where the performance was going to take place and who would be performing at the final recital seemed to be comforting for the participants.

Another effective aspect of the study, according to Harrison, was the fact that she was required to do the work because of the weekly assignments. Matt agreed, saying that "It was a great help for mental practicing to have someone tell you, 'Do

mental practice now.'" The participants agreed that having someone there to assign the work and make sure it was completed made it easier to engage in mental practice than if they were trying to do it on their own. Margaret said that because they had to write something about their work in the practice logs, it forced her to actually do the work and helped her "to make time for it." Since keeping a written account of mental practice work was seen as an effective part of the study, perhaps it would be beneficial for all students to keep practice logs. This requirement would hold the students accountable for completing practice assignments and would also allow them to see a record of their progress.

When asked if the study was effective, all of the participants nodded and said that yes, it was. Margaret said that all of the techniques used, including mental practice, relaxation techniques, imagery, and watching videotapes, were effective. Matt said that the study worked well because he became so focused on just one piece. He said "For me, it was a lot of different things attacking me at once, because I was more focused on that piece. If I wouldn't have done this, I wouldn't have been as focused on that piece. And so, I'm just taking different approaches to the same thing. It helped so much… It was just that intense focus on one thing." Matt also noted that he enjoyed imagery more than anything else.

Harrison said that she thought watching videotapes really helped her a lot. When asked if it helped with her sound ideal or the image of her body motions, she said that it was her sound, and Stephen, Matt, and Annie agreed. Matt said "It forced me to think about the sound. I would choose to create this, instead of letting it happen, and it got easier to do as I watched the tapes." Margaret, however, felt that it really helped to

watch her body. She said "I saw a lot of tension that I really wasn't aware of until I saw myself."

Harrison said that one of her favorite imagery exercises was the one that she did during the last week of the study. She chose to use the imagery that helped to develop a "winning feeling." In this imagery exercise, the participant was to identify a prior performance where she had a "winning feeling" and decide on a word or phrase that best triggered that feeling. She said "That was amazing, it was fantastic. I ended up doing it a lot. I had a montage in my head of all these great moments in my life and people shaking my hand. It was really silly but when I got done, I felt great and my practicing felt great."

Annie agreed, saying, "I did that one too and really liked it. When I would think about it, it just brought this feeling to the surface, this confidence." When asked if it helped Harrison with confidence, she said, "Oh yeah. I was walking to school today and you have this word that you're supposed to use as your cue, and mine was 'sparkle.' And I just kept thinking that to myself: 'sparkle.' I know it's corny, but it really worked."

The participants were also asked if there were any type of mental practice that specifically appealed to them or did not appeal to them. Stephen said that "any time I visualized my hands, it seemed to help more than visualizing the music [the score]." The researcher asked the participants if they were all able to see the score in their mind. Margaret said, "I can see my score in my head. I couldn't do it at the beginning, but I can do it now, I can see the whole score." Harrison said that she had always been able to see the score.

Margaret reiterated the importance of being able to see the score by saying "that visual memory is really important, I think. I know if I can do that I've really got it. For me it's like a big test." Matt disagreed, saying "The score doesn't help me at all. I have to be able to see what my hands are doing. Because when I memorize a big piece, basically the problem is getting it off the score to just seeing what my hands are doing." Margaret said that she also imagined what her hands look like on the keyboard.

Harrison said that she watches both the score and the keyboard in her mind. "When doing the mental practice," she said, "I see both the score and the keyboard… I blend the score onto the image of my hands on the keyboard. It happened while I was mentally practicing. It was sort of blurred, but then really clear." Margaret said that she did that, as well.

Annie reported that the kind of mental practice that was most difficult for her was when they worked backwards, starting at the end. Margaret concurred, saying "I couldn't get through it. I felt like it was too much, it was frustrating." Matt even said "It was kind of detrimental to the study, it kind of destroyed my confidence." Margaret agreed, saying, "That was what I felt, it completely destroyed my confidence. I just didn't want to feel that way… that I don't really know this [piece], do I?"

During the group session after Week Three, after the participants had been going through the mental practice in which they worked section-by section through the piece, three of the participants had commented personally to the researcher that they were frustrated by that kind of mental practice because they could not focus for such a long period. Although the research studies have shown an optimal period of mental

practice to be 15-20 minutes, these participants felt differently. They all agreed that the optimal period for mental practice was no longer than five minutes.

Annie did say that the "spot stuff" really worked for her, referring to the mental practice techniques in which they just rehearsed a small part of their piece in detail. Harrison said that it helped her to go back and forth between mental and physical practice. She said that when doing that, "I can do it for thirty minutes." Margaret thought she needed to do more of that type of practice, alternating between mental and physical practice. Harrison had also written in her practice logs that she found the alternation between physical and mental practice to be very useful. It is possible that using more of this technique rather than straight mental practice may have been more useful and less frustrating for the participants.

The researcher asked whether the relaxation techniques were helpful. Matt said "Last semester I worked so much on posture, and the [relaxation techniques] really helped me to keep doing that, because I became much more aware of tension. I really noticed it in my neck, which is where my tension stems from. I would do the progressive relaxation first, and then I would play, and right away I would sense where the tension was… and I could immediately get rid of it."

Margaret also said that the progressive relaxation exercises helped her to be more aware of tension. She said that it also became easier for her to get rid of tension. She said, "It worked. More so than I even thought it would." Annie said that the relaxation techniques really helped her when she was practicing, "but not necessarily when I was performing."

Margaret also mentioned that the relaxation training helped her to get rid of "those inner judges." She was referring to the use of "self-talk;" self-talk can have a negative impact when a musician mentally reminds himself about what "not" to do or what is going badly during a performance. It can also have a positive impact if a musician practices cues about what to listen for or says things to himself like "That's it, keep the right hand singing." Margaret seemed to think that the relaxation techniques helped get rid of the "inner judges" because it lessened her tension and stress while playing.

One of the aspects of the study that some of the participants would have changed was the timing of the study. All of the participants felt like it became more difficult over the course of the study to find the time necessary to complete the mental practice assignments. Harrison said that "as things got busier, it was hard to devote much time. I wish I could have had more time to really focus on it." Stephen agreed, saying that "if we could have done it during the summer or sometime when there wasn't so much going on and just done this, not worked on any other piece" that he might have been able to focus on the study more. Margaret argued, however, that if the study took place at a time when the participants were less busy such as the summer, "That wouldn't have been real… I mean we're all stressed and too busy, and she wouldn't have gotten a true demonstration of how it works in real life."

Matt came up with the idea that it would be effective to have a two-part session. The first one could take place during the summer, when participants were less busy and they could learn the basics of the techniques. He thought that the second session should

take place during the semester when the participants could implement the techniques into their daily routine.

When asked about the duration of the study, the participants felt that it seemed like a lot to learn in a four-week session, and the techniques would need to be implemented over a longer period of time to really understand their effectiveness. Harrison felt that the techniques learned in the study would help her more in the long run as she continued to use them on an individual basis. She said that "In one way, I wish it had been spread out longer, but in another way, I'm glad we learned all of it, and so now I can use it on my own."

The participants were also asked how the techniques fit in with the learning stage of their chosen piece. All of the participants began the study with a memorized piece, but some participants had just finished memorizing the piece and other participants had been playing their piece for a long time. Both Annie and Stephen felt like they got bored with the techniques because they had been working on their pieces for a long time, and their pieces were very short. Stephen said that he felt like he was "practicing the same thing over and over again."

Harrison said "I had just memorized mine for the jury [the previous semester], so it was kind of nice to get back to it." She was working on a piece by Bach, and she said that she had always been intimidated by Bach, but the mental practice work in particular helped her to feel more comfortable with it. Margaret likewise said that "I had just memorized mine, so for me it was just the right time. I felt really unsure of it when I first played it, so I really got to see it grow."

The participants were also asked to comment on any differences between the first and last performances. Annie said that she felt more nervous before the final recital than she did for the first performance. She felt like "there was a certain amount of pressure because we'd been working so long for this one event." But she also said that "Even while I was nervous I also felt that I know when I get up there and start playing that it will be okay. I felt much more confident about the playing part. But I was nervous before starting… I was actually shaking."

Matt also said that he was "definitely more nervous" for the final performance. He said "I was more nervous for this than I had been for anything in a long time. I felt like it was a full recital I was playing, you know, Carnegie Hall or something, it was that level of nervousness." Matt had a solo recital coming up the next weekend, so that added some additional anxiety for him. Interestingly, however, he felt like he was better able to cope with his anxiety than he had been in any previous performances. He said "I dealt with it a million times better" than he had before. He added, "As far as my nerves affecting how I played, it's the least my nerves have affected what I did physically." He also said that "usually I'm confident walking out, I'm calm right up until I put my hands on the piano. And this time I was really nervous until I started playing, and the first thing was kind of shaky and I felt better and better; it wasn't like I was out of control ever."

Margaret, on the other hand, did not feel nervous at the final recital. She said "I felt really calm." She said this performance was unusual because she is usually nervous before and during her performance. She said "This is really interesting, it's never happened to me before. I felt calm while I was playing, and then at the end, my heart

was racing. Today I didn't feel it 'til after I'd finished. It was weird; usually it's just the opposite." Afterward she thought to herself "that was nice, I could do that again."

It seems that in regard to the level of anxiety, the pressure of playing in the formal recital setting in front of a large audience and having prepared so long for one performance made many of the participants feel very nervous before the final recital. However, all of the participants, and particularly Matt, Annie, and Margaret, seemed to be better prepared to cope with their anxiety.

Both Annie and Matt felt nervous before playing, but once the performance began, they felt calm, in control, and actually enjoyed performing. They had used both imagery rehearsal and weekly performance sessions to rehearse for their final performance, and this work helped them to feel confident and more prepared for the performance, according to their final evaluations. It also enabled them to continually rehearse the act of performing, so they were prepared when they got on stage and were not affected by nervousness.

The participants differed in the amount of anxiety that they felt during the weekly performances. Annie thought it was a "big jump" from Session IV to Session V because there was a great deal more pressure at the final recital. She said "the previous session was a whole structure lower."

Harrison also said that the weekly performances felt very different than the final recital. "I never felt nervous when we played for each other in the study. I just kind of felt like, these are my friends. And sometimes I didn't wear my shoes, and we had all relaxed together. And we knew that we were all working on anxiety… I think it was really practical performing."

Margaret, however, said that she was nervous about playing every week. "I practiced being nervous, I guess. I'm really good at that." Perhaps the fact that Margaret had "practiced being nervous" every week helped her to feel calmer at the final recital. Harrison said "Maybe I should have treated it more formally," since treating the weekly performances that way may have better prepared her for the final recital.

Some of the participants agreed that the weekly group sessions may have been more helpful in preparing for the final recital if there was more pressure and anxiety connected to the performances. Matt postulated that instead of having the same people around every week, "you could add someone new, and add a little anxiety through that. Like, maybe after the first performance, you invite one stranger to come in, or maybe a faculty member or something." Harrison agreed, saying that it would be better not to tell the participants who it would be to add more anxiety. Matt also said that it might work well to change locations at each session.

But Margaret disagreed, saying, "I think that would really ruin the study if you did that. That would just totally screw it up for me. Because the whole idea of this is, you're trying to build confidence and security in yourself. And if you're constantly bombarded with something you don't expect, I can't feel safe… I have to have a lot of safety before I have security."

The researcher asked the participants if there were anything else that they would have changed about the study. Margaret said, "Don't make me do mental practice right before I play." Before the final recital, after the progressive relaxation exercise, the participants were asked to imagine the successful "end result" of their performance,

followed by detailed mental practice of a specific part of the piece. Margaret did not do this mental practice because she had an experience once before where she did something wrong during mental practice and then she could not "turn it off." If the mental practice work did not go perfectly, she would be worried that she would "screw it up on stage." Instead, she imagined a warm fire so that her hands could stay warm. The other participants did not seem to have the same concern, but Margaret did bring up a valid point. It may be a bad idea to do detailed mental practice immediately prior to a performance unless it is done while actually reading the score to prevent any mistakes or worries.

Overall, the final interview revealed that the participants enjoyed the study, felt that it was effective, and believed that the techniques would become even more useful as they continued to use them over an extended period of time. The group atmosphere helped them to feel like a "team," and the relaxation exercises helped them to recognize and eliminate physical tension. Watching videotapes helped with creating the right sound and noticing inefficient movement patterns. In addition, although they felt nervous before the final performance, Matt, Annie, and Margaret all felt that they were more equipped to cope with the feelings of anxiety so that they still performed in a way that met their high expectations.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The present study was exploratory in nature and was designed to examine the effects of the combined use of mental practice, imagery, and relaxation techniques on performance enhancement. The purpose of the study was to specifically examine how these techniques might be used by musicians and whether they had any effect on the following five areas: confidence in ability (self-efficacy), level of concentration during performance, memory of a piece, ability to regulate arousal or control anxiety, and the musician's perception of the overall success of a performance. It was designed to present a model of how these techniques might be used and to examine whether musicians perceived it to be effective in enhancing their performance ability. At the final interview, all five participants stated that they perceived the study to have been effective in enhancing their performance ability. A closer analysis will reveal the ways in which it was effective.

The research study proposed to answer the following five questions:

6. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect a musician's level of confidence in his or her ability?

7. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect a musician's level of concentration during performance?

8. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect how solid a musician's memory of the piece is during performance?

9. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect a musician's level of anxiety during performance?

10. Does the use of relaxation techniques combined with imagery rehearsal, including mental practice and the visualization of a successful performance, affect a musician's evaluation of the overall success of a performance?

This chapter will summarize participant comments and ratings from Practice Logs (appendix K), Imagery Exercise Worksheets (appendix J), Videotape Evaluations (appendix F), the Final Evaluation (appendix N), and the final interview in order to provide a comprehensive view of the participants' perceptions of how mental practice, imagery, and relaxation techniques affected their ability to perform one specific piece. It will address the use of mental practice, imagery, and relaxation separately in regard to the specific areas of confidence, concentration, memory, anxiety, and perception of overall performance.

Summary

Although all five areas seemed to be influenced by the use of imagery, relaxation techniques, and mental practice, the areas that seemed to be most influenced were confidence, anxiety, perception of overall performance, and concentration. Of these four areas, confidence and arousal regulation seemed to be the most highly influenced. These areas were probably affected most because the relaxation techniques combined with the imagery routine were designed to promote a more relaxed and confident approach to performance. Although there was some evidence that memory improved over the course of the study, the evidence was more conflicting in this area. The participants had already memorized their pieces before beginning the study, and none of the participants had any specific difficulties in the area of memory. Therefore, it is difficult to prove that the imagery, mental practice, and relaxation techniques had any impact on the participants' memory of their chosen piece. The following section contains more detailed analysis of the impact of imagery, mental practice, and relaxation techniques on self-confidence, arousal regulation, overall performance, concentration, and memory.

Self-Confidence

On the final evaluation, self-confidence received the most votes as the area that was influenced the most by the use of relaxation techniques, mental practice,

and imagery. In addition, all five participants said that they felt more confident in the final performance than they did in the first performance. The videotape evaluations, the collaborative nature of the group setting, and the use of imagery seemed to have the most impact on the participants' increase in self-confidence. In naming which techniques helped the participants to feel more confident, imagery and performing each week in the sessions were named most often. The fact that the participants' self-confidence increased during their involvement with the study offers support for the self-efficacy theory. The self-efficacy theory suggests that imagery practice heightens the practitioner's expectations for success, which in turn enhances his performance.

In addition, all five participants stated that they felt more prepared at their performance in Session V when compared with how they felt at their performance in Session I. Feeling prepared for a performance is related to feeling confident about a performance; one must feel prepared in order to feel confident. Mental practice, imagery, and watching videotapes of previous performances were named the most often when the participants were asked which techniques helped them to feel prepared.

Comments from participants on videotape evaluations reflected an increase in self-confidence. First of all, the ratings on videotape evaluations rose on each subsequent performance, and the highest means in all five categories were found on the videotape evaluations from Session V. Although these ratings may be used to show that the performances improved, it is an admittedly

subjective measurement and therefore also shows that the performers' confidence in their ability had improved.

Specific comments from participants reflect the idea that watching a videotape of oneself may improve one's perception of performance ability. For instance, Harrison wrote on her videotape evaluation of Session I that "overall, the performance did not appear on videotape as badly as it did in my head." She also wrote that "mistakes were not as huge as I thought they were." She also wrote after Session V that "I really enjoyed watching myself. Even though I was really nervous, I looked like I was enjoying the music." Stephen wrote a similar comment in Session V: "I couldn't really tell how well the performance went while I was playing, but it wasn't bad when I watched it on tape." Margaret also stated that because of watching the videotape, she felt more confident about her playing. She wrote after watching the videotape of Session IV that "I know I know this piece."

Another area that influenced the participants' level of self-confidence was imagery. Specifically, Harrison and Annie found the "winning feeling" imagery used during Week Four to be the most effective. During the final interview, Harrison said that she really enjoyed this type of imagery and that it worked well. She said "that was amazing… when I got done, I felt great and my practicing felt great." Annie agreed, saying that "It just brought this feeling to the surface, this confidence."

The participants were given a great deal of control during the study. They were able to make personal decisions in the following areas: their final goals for the study;

the scenes that they would use during imagery; what type of imagery they would use during Week Four; and what type of mental practice they would use during Week Four. In addition, the participants' opinions were regarded as important and valid because they were asked about how mental practice, imagery, and relaxation techniques influenced their physical practice, understanding of the piece, and performance ability.

The researcher theorizes that enabling participants to make their own choices had two main effects. First, it allowed the participants to make the study their own by individualizing it according to their own needs. Secondly, it reflected a trust by the researcher that the participants were competent musicians who were able to perceive how their musicianship was affected by the techniques used in the study. It is the researcher's personal belief that the participants' self-confidence was affected in a positive way by the amount of control and responsibility that they were given over the course of the study.

Regulation of Arousal

It is important for performers to be able to regulate their level of anxiety or arousal during a performance so that they maintain control over their physical actions and mental fluctuations. The role of arousal in performance is very complex, and it was not the aim of the present study to eliminate arousal completely. Instead, imagery and relaxation techniques were used to help participants become aware of muscular tension and learn to cope with the emotional anxiety associated with performance.

The State/Trait Anxiety Inventory (STAI) and Personal Report of Confidence as a Performer (PRCP) were two statistical tests used to provide an objective examination of how the techniques used in the study affected the participants' level of anxiety prior to performance. Both tests were taken prior to the performance in Session I as a pre-test and prior to the performance in Session V as a post-test. The results of the two tests were compared using a Wilcoxon Signed-Ranks test to see whether there was a statistically significant difference between the pre-test and post test scores.

The mean scores on all three post-tests were lower than the mean scores on the pre-tests. These scores indicate that the participants tended to have a lower level of anxiety after engaging in imagery and relaxation exercises for four weeks. All five participants received lower scores on the post-test of the State portion of the STAI when compared with the pre-test. Four of the five participants received lower scores on the post-test of the PRCP when compared with the pre-test. In particular, Harrison's State score on the State/Trait Anxiety Inventory was reduced by 27 points from pre-test to post-test, and Margaret's score on the Personal Report of Confidence as a Performer was reduced by 9 points, which is almost a third of the maximum score on the test.

Interestingly, four of the participants stated that they felt "more nervous" prior to Session V, but all five participants' scores on the State portion of the State/Trait Anxiety Inventory were lower than they had been prior to the first performance. The comparison between the statistical test and self-report by the participants seems conflicting, but upon examination reveals an intriguing possibility. Perhaps the participants did feel a greater amount of stress in relation to the final performance because of the large audience, formal setting, and presence of the piano faculty.

However, maybe they were more prepared to cope with this greater amount of stress because they had a greater amount of confidence, felt more prepared for the performance, and had been practicing relaxation techniques and imagery for the past four weeks.

In fact, comments from the participants support this idea. Although Annie stated that she was more nervous before the final recital, she also said that "Even while I was nervous I also felt that I know when I get up there and start playing that it will be okay. I felt much more confident about the playing part." Matt also said that he was more nervous before this performance than he had been "for anything in a long time," but he said that he "dealt with it a million times better" than he had before. He said that "As far as my nerves affecting how I played, it's the least my nerves have affected what I did physically."

Overall Performance

An examination of the videotape evaluation ratings shows a general trend that the participants continually gave themselves higher ratings on each subsequent performance. Indeed, all six areas of concentration, confidence, accuracy, memory, musicality, and overall performance saw improvement over the course of the study, both in their mean scores each week and among the individual participants. The highest mean scores in each category were found in Session V at the final performance. The highest scores for individuals in each category were also found at Session V, with

the exception of Harrison's score dropping by one point for memory and Annie's score dropping by one point for accuracy.

The biggest improvement in the videotape evaluations may be seen in the overall performance score. In comparing the mean score for overall performance in Session I to that in Session V, the mean increased by 3.3 points. Margaret showed the greatest change in this area; her score rose from a 2 in Session I to a 9 in Session V. On her Videotape Evaluation for Session V, she wrote that "I was very happy about this performance and the improvement I've seen and heard over the last month." Although Annie's score for overall performance only increased by .5 points from Session I to Session V, the other participants saw a more significant difference: Matt's score increased by four points, Stephen's score by two points, and Harrison's score by three points.

There is obviously a relationship between the areas of confidence and overall performance. Having confidence in one's performance ability may actually help musicians to become better performers if it reduces excess anxiety, enhances one's energy level, and enables the musician to have more enthusiasm about performing and even a better connection with the audience. A second factor is that as the participants began to feel more confidence in their performance ability, they may have perceived their performances to be more successful. That change in perception would lead them to give higher ratings to their videotape evaluations. The score for "overall performance" is therefore inherently related to the increase in confidence that the participants felt over the course of the study.

The overall performance score may be seen as the most significant category in which the participants rated themselves. Its significance lies in the fact that the participants were able to rate themselves based on what they considered to be the most important facets of the performance. Some performers think that absolute accuracy is necessary for a performance to be successful, while other performers believe that a performance can have many wrong notes and even a memory slip as long as the most important factor is present, whether that is drama, energy, musicality, concentration, or a connection to the audience. The overall performance score showed the largest positive change from Session I to Session V, and that indicates that the participants perceived improvement in what they regarded to be the most important facets of their musicianship.

Concentration

One question on the Final Evaluation asked the participants to name which area was influenced most by the techniques used in the study and Matt named concentration. For him, the ability to concentrate was affected more than any other area. In addition, three participants felt that their concentration level was higher at the final performance than it was at the first performance. This finding indicates that mental practice, imagery, and relaxation techniques may have a powerful effect on concentration, especially if used over a longer period of time.

Stephen said that his concentration level was lower during the final performance because there was a larger audience. This statement indicates a perception that there is

a connection between arousal and concentration. Certainly, when anxiety is out of control, it can lead to poor concentration and memory. However, an optimal level of arousal can increase both energy and concentration, even leading to a hyper-focused state. For the three participants who said that their concentration level was higher, it may have been affected by the fact that they were more in control of their level of arousal. It may have also been a result of the fact that they had been engaging in mental practice and imagery for the past four weeks, both of which require extended periods of focus and concentration.

When the three participants were asked what techniques helped their concentration level improve, mental practice was named most often. Although the participants complained about being frustrated by mental practice, they did seem to feel that it enhanced their concentration. The participants felt that fifteen minutes was too long to fully concentrate while engaging in mental practice, but perhaps a continued use of mental practice would enable them to practice mentally for longer periods of time. In turn, their concentration ability may be further enhanced.

In examining the videotape evaluations, the mean score for concentration rose from a 5.2 in Session I to an 8 in Session V. This difference of 2.8 in the mean scores from Session I to Session V shows that there was some increase in the participants' ability to concentrate. Although not every participant's score for concentration rose consistently at every session, Annie's scores did. Her first concentration score was a 5 at Session I and rose to a 6 at Session II, a 7 at Session III, an 8 at Session IV, and a 9 at Session V. Margaret's scores also rose fairly consistently, beginning with a 2 in Session I and moving up to a 9 in Session V.

Memory

The most conflicting results of the study were related to memory. Part of the problem in evaluating this area results from the fact that all five participants had their piece memorized when the study began, and memory had fairly high ratings on the first videotape evaluation of Session I. Stephen even rated his memory a 10 at the first performance, indicating that he did not feel a great need for improvement in this area.

On the Final Evaluation, when asked if their memory was more or less stable at the final performance, only two people said that their memory was more stable, while three people said that it was the same as in the first session. No one said that their memory was less stable that in the first performance.

On the Videotape Evaluations, the highest mean score occurred in the area of memory, with a mean of 8.8 at Session V. Memory was also the only area in which the mean scores were higher at each subsequent session. Both of these facts lend support for the idea that mental practice and relaxation assisted in the participants' memory of their pieces. Memory ratings saw the greatest change in Margaret's score, which rose from a 2 in Session I to a 9 in Session V.

Stephen's score stayed at 10 on every session. Matt's score for memory was also a 10 at Session V, but it was not a great difference because his score in Session I was a 9. Harrison's score actually was lowered by one point from Session I to Session V, but her score for memory did rise to a 10 at Session IV. Similarly, Annie's score rose to a 10 at Session IV but was lowered back to a 9 in Session V, resulting in a three-point increase from Session I to Session V. Overall, it is difficult to observe whether the techniques used in the study had any overall effect on memory.

In order to really "know" a piece, it must be memorized. Memory offers the foundation for the other parts of the performance; accuracy, musicality, confidence, and the overall performance depend on a solid memory of the music. It is the building block on which the other facets of the music are based. However, once a piece has been memorized, it is just a part of the whole performance that depends on other elements, such as concentration, arousal regulation, and confidence in order to be maintained.

One of the problems with discussing memory problems in performance is that they are usually related to issues in dealing with anxiety or approaching a performance with confidence. Many musicians have had the experience of having a piece memorized and testing their memory over and over again, only to get in front of an audience and have a memory slip in an unexpected section. These problems usually occur because the performer feels more anxiety than usual. He may question his ability to play the piece or worry about what is ahead in the music. He may try to control what is happening rather than merely allowing his muscles to do what they have been trained to do. Imagery and relaxation techniques may not help a musician memorize a piece of music, but the use of these techniques may enhance a musician's confidence in his skill and help him to attain a more optimal level of arousal. The result may affect his ability to successfully demonstrate his understanding of a piece that has already been prepared and memorized effectively.

Videotape Evaluations

The videotape evaluations proved to be useful in helping the participants to become aware of issues that they did not notice during performance. Participants noticed both technical and musical issues that they were then able to work on during practice sessions and focus on during performance. Harrison wrote in her Videotape Evaluation of Session IV that "I think the videotape affects my playing more than anything. The impression of that really sticks in my mind."

In the Final Interview, Harrison restated that comment by saying that watching videotapes really helped her, specifically by providing an aural model. Stephen, Matt, and Annie agreed that watching the videotapes helped them with creating the right sound for their piece. Matt said that "It forced me to think about the sound. I would choose to create this, instead of letting it happen, and it got easier to do as I watched the tapes."

Margaret felt that it really helped her to watch her physical movements on the tape, saying that she saw a great deal of tension of which she had previously been unaware. In their comments on the Videotape Evaluations, Matt and Margaret seemed to emphasize their body movements, posture, and tension the most. Both Matt and Margaret also seemed to feel that the tension in their playing was lessened by what they learned from watching the videotapes.

The Videotape Evaluations also affected the participants' physical practice. For instance, Matt was more conscious of the position of his head over his body during practice after Session I. After watching her videotape from Session I, Harrison practiced relaxing the tempo in cadences and in Session II, she practiced bringing out

the left hand. In Session III, Matt, Annie, and Margaret practiced specific parts of their piece with which they were not satisfied after watching the video.

There was also evidence of improvement that may be found in subject comments from the Videotape Evaluations. For instance, Matt noticed that his neck was bent forward in the first session, and observed that he had a stiff upper body in the second session. After Session III, he wrote that "My posture is getting better. I wasn't leaning my head forward the entire time."

In Session I, Margaret felt that her body movements looked stiff, and she also noticed that her elbows and right hand wrist were locked. After becoming aware of those problems, Margaret seemed to have corrected them in time for her performance in Session II. She wrote in her videotape evaluation of Session II that "My arms looked better than last time. I felt freer and more sure of myself."

Annie thought she looked "disengaged" during the first performance. In the second performance, she saw herself making disapproving facial expressions and noticed how detrimental these expressions could be in "conveying musical ideas and a sense of confidence." Like Matt and Margaret, she also saw improvement by watching the videotapes. After Session III she wrote that "It looked like I felt pretty comfortable performing," and she thought that the piece had more intensity and character than before.

Overall, watching videotapes seemed to be a powerful technique that offered its own benefits. Watching the videotapes allowed the participants to have a visual and aural model of their own playing, which was a type of imagery in itself. Although it was intended mainly as a way to help participants objectively evaluate their

performance, it seemed to be helpful in helping the participants identify physical and musical issues that were hindering their performance. It also seemed to enhance their self-confidence, since Stephen and Harrison said that their performances sometimes seemed better on videotape than during the performance. In summary, the videotape provided a more objective model than memory and it allowed the participants to become more detached viewers who could learn from their work rather than judge themselves by it.

Relaxation Techniques

The relaxation techniques used in the present study included deep breathing, progressive muscular relaxation, and imagery using a relaxation scene. During each group session, the participants began by doing deep breathing and progressive muscular relaxation before transitioning into the imagery exercise. Progressive relaxation was also used prior to imagery sessions by the participants on an individual basis during the week.

The relaxation techniques were used to help the participants associate the image of performance with a physically and mentally relaxed state. A second purpose of the relaxation exercises was to lessen general anxiety, help participants recognize and eliminate muscular tension, and enable them to feel more relaxed during their physical practice sessions. Subject comments indicated that the relaxation exercises did help in all of these areas.

In regard to its effect on physical practice, the relaxation exercises used individually during the week seemed to help the participants to become more aware of physical tension in their playing. Margaret said that after doing progressive relaxation, she felt more relaxed and more aware of tension in her body, and was even able to practice for longer periods. Matt also indicated that he was more aware of tension while practicing and that it became easier to relax those areas. Harrison similarly said that beginning the practice session in a relaxed state helped her to notice tension from the outset. These same comments were stated again at the final interview.

Harrison also wrote that doing progressive relaxation exercises before practicing helped her to "hear better;" she wrote that "my ears seemed 'open,' and I listened better." She also indicated that using relaxation techniques before practicing helped her to approach the practice session with a clear mind.

Participants were asked to rate their level of relaxation at each group session. The ratings gradually rose until Session IV, which indicates that the participants were able to become more deeply relaxed with more practice at progressive relaxation. The mean went up from 7.8 in Session I to 8.4 in Session II, up to 9.2 in Session III, and up to 9.25 in Session IV. The mean score at Session IV for relaxation was the highest rating in any session. The mean for relaxation at Session V was an 8.4. Since the participants were nervous about the upcoming performance, it probably was not as easy for them to become deeply relaxed just before the final recital.

Overall, the mean score for relaxation at all five sessions was an 8.55, and no participant ever rated their level of relaxation less than 5. These relatively high

ratings for relaxation indicate that the technique of progressive relaxation was effective in helping participants reach a level of deep relaxation prior to using imagery.

Imagery

On the Final Evaluation, imagery was named by two participants as the technique used in the study that influenced their final performance the most. Along with mental practice, imagery received the most votes on other questions on the final evaluation about what techniques influenced changes in self-confidence, anxiety, memory, concentration, and feeling prepared for performance. Matt said that the imagery work was his favorite part of the study.

Like the ratings for relaxation at the group sessions, the ratings for imagery clarity and controllability were also higher at each subsequent session. Imagery clarity rose from a 7.8 in Session I to its highest rating of 9.1 in Session V, and imagery controllability rose from a 7.6 in Session I to its highest rating of 9.8 in Session V. The individual ratings for both imagery controllability and imagery clarity were always 6 or higher. The mean score for controllability during all five sessions was an 8.28, while the mean score for imagery clarity was an 8.46. The subjects therefore seemed to have very clear and controlled imagery throughout the study, but their imagery ability did seem to increase with practice over the course of the study. Comments from subjects on the Imagery Exercise Worksheets (appendix J) echo this finding.

Mental Practice

Like imagery, on the Final Evaluation mental practice was named by two participants as the technique used in the study that had the most influence on their final performance. It was also given the same number of votes as imagery when participants were asked what techniques influenced changes in self-confidence, anxiety, memory, concentration, and feeling prepared for performance.

Mental practice work was regarded as useful by the participants, but some types of mental practice were seen as being more effective than others. The type of practice that seemed the most useful according to the mental practice logs was completed during Week One, when the participants "heard" their piece in their mind while reading over the score, physically tapped the piece while reading over the score, or visualized the score in their mind.

The type of practice that seemed least effective to the participants was done during Week Three when participants were asked to review the piece section-by-section, working backwards from the last section of the piece. The participants became frustrated because it took a long time and took a great deal of concentration. It also made them question whether they really knew their piece very well.

Comments from the participants may be used to pinpoint how mental practice was effective. During Week One, Harrison wrote on the first day when she heard the piece while reading the score that "I noticed new things in the score" and that "it was easier to get a better idea of the big picture." Matt wrote on the same day that his "ears worked better." Similarly, Harrison said that she could "listen so much better"

on the second day of practice when she physically tapped the piece while reading the score.

Margaret wrote on the second day that being "able to concentrate on just the kinesthetic motions" without the addition of the piano helped her in memorization. Annie agreed that mental practice helped her memory of the piece. On the third day of practice, after visualizing the score in her mind, she wrote that "By practicing directly after picturing the piece, I had better memory because I could visualize the music and think ahead."

For Matt, the mental practice techniques used during Week One helped him to get rid of some physical tension. On the third day of practice when he visualized the score in his mind, he remembered areas in which his arms would tighten, so he imagined a more relaxed approach in these areas. Margaret tried a similar technique during Week Four, when she visualized herself playing her piece in a "totally free, relaxed way." This helped with her musicality because it enabled her to just let the music happen rather than trying to force it and creating tension.

Annie wrote during the second week that mental practice helped her to have more clearly defined goals in her practicing. Although none of the other participants made this type of comment, it was one of the intentions of the mental practice assignments to help participants pinpoint problem areas and come up with their own solutions. Mental practice can be very useful in this way because it forces musicians to think about what they want to create rather the action itself. It is easy during physical practice to pay attention only to physical gestures, but mental practice takes the kinesthetic motions away and requires a more focused, intellectual approach.

The mere act of assigning specific, required mental practice tasks was useful for the participants. It is often difficult to find the time or the initiative to do mental practice on one's own, even when one knows that it would be beneficial. Harrison, Margaret, and Matt all said during the final interview that the requirement to do mental practice and write about it was one of the benefits of the study.

One of the interesting and important findings of the study was that the required 15- to 20-minute mental practice period was seen as being too long by the five participants. Although a meta-analysis on mental practice in the sport psychology literature recommended a period of 20 minutes as a practical guideline for implementing mental practice (Driskell, Copper, and Moran 1994), this amount of time was too long for the participants in the present study. However, the writers of the meta-analysis did indicate that as the overall length of mental practice increases, the beneficial effect decreases. The participants in the present study would have agreed with that statement.

The participants did not feel that they could concentrate well for a period of 15 minutes, and the work became frustrating after that amount of time and therefore ineffective. After spending 15 minutes on mental practice, Stephen said that it was very satisfying to actually sit down and physically practice the piece. Harrison even said that she fell asleep when trying to do mental practice for that length of time.

The participants stated that an optimal period of mental practice was only five minutes. That was the maximum amount of time that they could stay focused on their piece and really get the most benefit from mental practice. As an alternate option to doing one session of mental practice for fifteen minutes, it might be recommended for

musicians to do mental practice for only five minutes at different times during the day. It is expected that with regular mental practice, the ability to concentrate would increase and musicians would be able to practice mentally for gradually longer periods of time.

Another option is to alternate mental and physical practice. Harrison found this type of practice to be very satisfying, and even said that she could do this type of practice for thirty minutes. For instance, during Week Two, Harrison mentally practiced by "listening" to different ways to articulate the left hand, and then imitating them physically. She also mentally practiced one hand while physically playing the other hand, and then physically played both hands.

By combining mental and physical practice, musicians may still receive the benefits of mental practice without becoming frustrated by it. One can use Freymuth's (1999) model of the three-step practice loop which includes ideal projection, action, and mental recall. Using this practice cycle, the musician would imagine a phrase or longer section of music exactly as he would like it to be played; then he would physically try to recreate this sound; and then he would recall what he had played to see how well it matched the ideal model.

Conclusions

The five participants stated in the final interview that the techniques used in the study were perceived to have been effective in enhancing

their performing ability. The areas that seemed to be most influenced by these techniques were confidence and regulation of anxiety, but some participants felt that the areas of concentration and memory were also positively affected by these techniques. The post-test scores on the State/Trait Anxiety Inventory (STAI) and Personal Report of Confidence as a Performer (PRCP) reveal a trend toward lower scores after participation in the study.

The participants' self-report ratings on their imagery ability and level of relaxation consistently rose at each group session. The participants gave themselves high ratings throughout the study on imagery clarity and controllability, with individual scores that were always at 6 or higher on a scale of 1 to 10. Their imagery ability increased with practice and the highest means for clarity and controllability were found at Session V. Imagery and mental practice were the techniques that received the highest ratings for being useful in the Final Evaluation (appendix M).

The participants also had high relaxation ratings throughout the study, but their level of relaxation reached its peak at Session IV. Participants stated that the relaxation exercises helped them to recognize and eliminate physical tension and approach practicing with a clear mind. It seems clear from the participants' comments that watching videotaped performances and practicing progressive relaxation was a powerful combination. It helped the musicians to become aware of tension in their playing while watching videotapes and learn to eliminate the tension by practicing progressive relaxation.

The participants found it difficult to concentrate for fifteen minutes while doing mental practice. They recommended a period of five minutes as an optimal amount of time to engage in mental practice. The types of mental practice that were found to be most effective were the following: "spot" work in which a specific section of the piece was repeatedly practiced; alternating mental and physical practice; and hearing the piece mentally while reading over the score, tapping the piece, or visualizing the score. One participant found it particularly helpful for her concentration to alternate mental practice with physical practice.

The Videotape Evaluations (appendix F) were useful in helping participants notice physical tension and create the right sound for their piece. The performance ratings on the Videotape Evaluations tended to be gradually higher at each subsequent performance, and the highest means in all five areas of accuracy, concentration, memory, confidence, and overall performance were found in the final performance at Session V. The rise in performance ratings indicates that the musicians perceived an improvement in performance over the course of the study.

Recommendations for Further Study

This study has been an initial effort to present a model for the use of imagery, relaxation techniques, and mental practice by musicians hoping to improve their concentration, confidence, memory, ability to regulate arousal, and

overall performance. Further research on these topics is needed. Although the present study presented ways in which the techniques of mental practice, imagery, and progressive relaxation may be used by musicians, it did not investigate these topics separately or provide a prescription for their use that guarantees improvement. It was beyond the scope of this study to provide conclusive evidence that mental practice, imagery, and relaxation techniques cause positive changes in performance ability. However, it did explore the perceptions of five individuals who felt that these techniques positively affected their own performance ability.

The participants in the present study recommended a longer training period to take full advantage of the techniques used in the study. Another possible change to the present study as recommended by the participants would be to provide a recording of the researcher's voice rather than a written assignment for individual progressive relaxation exercises. Other researchers whose participants use relaxation techniques individually may elect to give their participants a recorded script of the relaxation exercise on audiotape. Furthermore, the researcher did not assign much mental practice work in which physical practice was alternated with mental practice. Subject comments from the present study indicate that this method would have been preferred. One participant said that it enabled her to concentrate for longer periods and that it was more effective than mental practice alone.

It would be advantageous for musicians to gain a deeper understanding of each of these techniques and their specific influences on particular areas of

musicianship. Consideration of the need for further research has produced the following recommendations:

1. This study was broad in scope and included the use of mental practice, relaxation, and imagery in one study. The study should be replicated but limited to either mental practice only or imagery and relaxation only. By limiting the study, it would be easier to understand the distinct effects of mental practice or imagery when used alone.

2. A similar study should employ the use of a control group consisting of participants who perform weekly and fill out videotape evaluations, but do not participate in the imagery or relaxation techniques. In this way, the study could compare the results of videotape evaluations between the two groups to see if performance change may be attributed to the use of imagery and relaxation.

3. This study should be replicated with a larger sample size for the purpose of presenting more definitive conclusions and permitting generalizations. A larger sample could provide more conclusive results with regard to the State/Trait Anxiety Inventory (STAI) and Personal Report of Confidence as a Performer (PRCP), as well as subject ratings of efficacy, imagery clarity, imagery controllability, relaxation, and videotape evaluations.

4. The relaxation, imagery, and mental practice techniques should be explored with different age groups at different levels of musical ability and/or maturity, as well as musicians who are not exclusively pianists. The present study

focused on the use of these techniques by graduate piano students, but these techniques could also be used with undergraduate students, high school students, and even children. Almost certainly, there would be different results and it would make an interesting comparison to see if there were larger performance effects, different attitudes toward the use of the techniques, and different ratings on relaxation and imagery clarity and controllability.

5. The study should be replicated over a longer period of time so that the participants are trained in the use of imagery and relaxation techniques over more weeks than the present study. A training period of six weeks or longer is recommended so that the researcher would have more opportunities for comparisons among sessions. Furthermore, a more extensive training period would enable participants to see more long-term results from the use of mental practice, imagery, and relaxation techniques.

6. A similar study should investigate the use of videotapes in critiquing and evaluating one's own performance. The present study found that the use of videotapes helped participants to recognize problems in musicality, muscular tension, and notice performance issues such as facial expressions and posture. Furthermore, the participants were enabled to lessen muscular tension, increase their bodily and aural awareness, and bring musical ideas from the videotape into their practice sessions. Some participants commented that their self-confidence increased after watching the videotape because it sounded better than they had expected. A similar study could investigate the use of obtaining

feedback from watching videotapes and the impact of this feedback on a musician's self-image.

7. The participants in the present study commented on the support that they felt from the other members of the group during their final performance. Although it was beyond the scope of the present study to investigate this topic further, a similar study should investigate educational literature on group work and begin to discern what positive aspects this may bring to musical performance. A similar study might evaluate the collaborative nature of having a group of subjects work together on imagery, mental practice, and relaxation techniques.

The author hopes that this document will stimulate further interest in the use of mental practice, imagery, and relaxation techniques for performance enhancement. The ultimate goal of the study was to explore how these techniques can be used by musicians. According to the participants, the techniques used were effective in helping them feel more confident and more prepared. According to the State/Trait Anxiety Inventory (STAI) and the Personal Report of Confidence as a Performer (PRCP), the techniques also helped to decrease performance anxiety. In addition, the participants felt that the techniques enhanced their performance ability on their chosen piece. With all of these benefits possible, the techniques of imagery, relaxation, and mental practice should be implemented into every musician's practice regimen.

BIBLIOGRAPHY

Agnew, Marie. 1922a. "The auditory imagery of great composers." *Psychological Monographs* 31: 279-87.

_____. 1922b. "A comparison of the auditory images of musicians, psychologists and children." *Psychological Monographs* 31, no. 1: 268-78.

Ahsen, Akhter. 1973. *Eidetic behavior.* Yonkers, NY: Eidetic Publishing House.

Anderson, Mark P. 1975. "Imaging as a self-control response to enhance voluntary tolerance of an aversive stimulus." Ph.D. diss., University of Texas.

_____, ed. 1980. *Doing sport psychology.* Champain, IL: Human Kinetics Publishers, Inc.

_____. 1981. "Assessment of imaginal processes: Approaches and issues." In *Cognitive assessment,* ed. T.V. Merluzzi, C.R. Glass, and M. Genest, 149-87. New York: Guilford Press.

Anderson, William G. 1899. "Studies in the effects of physical training." *American Physical Education Review* 4: 265-78.

Andre, John C. and John R. Means. 1986. "Rate of imagery in mental practice: An experimental investigation." *Journal of Sport Psychology* 8: 124-28.

Appel, Sylvia S. 1974. "Modifying solo performance anxiety in adult pianists." Ph.D. diss., Columbia University.

Arieti, Silvano. 1976. *Creativity: The magic synthesis.* New York: Basic Books.

Armstrong, Clairette P. 1953. "Some notes on imagery in psychophysical therapy." *Journal of General Psychology* 48: 231-40.

Atkinson, Rita L., Richard C. Atkinson, and Ernest R. Hilgard. 1983. *Introduction to psychology*. New York: Harcourt Brace Jovanovich, Inc.

Bandura, Albert. 1969. *Principles of behavior modification.* New York: Holt, Rinehart, and Winston.

_____. 1977. *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.

Bauer, R.M., and W.E. Craighead. 1979. "Psychophysiological responses to the imagination of fearful and neutral situations: The effects of imagery instructions." *Behavior Therapy* 10: 389-403.

Baum, Kenneth. 1999. *The mental edge: Maximize your sports potential with the mind-body connection.* With Richard Trubo. New York: Perigree.

Benson, Herbert. 1975. *The relaxation response*. New York: Avon Books.

_____. 1987. *Your maximum mind.* New York: Random House, Inc.

Bernstein, Douglas A. and Thomas D. Borkovec. 1973. *Progressive relaxation training: A manual for the helping professions.* With a foreword by Leonard P. Ullman. Champaign, IL: Research Press.

Betts, G.H. 1909. "The distribution and functions of mental imagery." In *Contributions to Education*, No. 26. New York: Columbia University, Teachers College.

Bird, 1984. E. "EMG quantification of mental rehearsal." *Perceptual and Motor Skills* 59: 899-906.

Block, Ned Joel, ed. 1981. *Imagery.* Cambridge, MA: MIT Press.

Bonpensiere, Luigi. 1953. *New pathways to piano technique: A study of the relations between mind and body with special reference to piano playing.* New York: Philosophical Library.

Borchert, Laroy Horace. 1991. "An overview of music and mental imagery with a pilot study of the relative effects of an instructional guide, image guide, and practice on the musical accuracy of undergraduate clarinetists." D.M.A. diss., Florida State University.

Bruckner, Susan. 1998. *The whole musican: A multi-sensory guide to practice, performance, and pedagogy.* Santa Cruz, CA: Effey Street Press.

Bruser, Madeline. 1997. *The art of practicing: A guide to making music from the heart.* New York, NY: Bell Tower.

Budney, Alan, Shane M. Murphy, and Robert L. Woolfolk. 1994. "Imagery and motor performance: What do we really know?" In *Imagery in Sports and Physical Performance,* eds. Anees A. Sheikh and Errol R. Korn, 97-120. Amityville, NY: Baywood Publishing Company, Inc.

Buegel, Herman F. 1927. "The effect of introducing ideational elements into perceptual-motor learning." *American Journal of Psychology* 48: 227-51.

Burnett, S. A., D.M. McLane, and L.M. Dratt. 1979. "Spatial visualization and sex differences in quantitative ability." *Intelligence* 3: 345-54.

Burton, D. 1990. "Multimodal stress management in sport: Current status and future directions." In *Stress and Performance in Sport*, ed. L.G. Jones and L. Hardy, 171-201. Chichester: John Wiley and Sons.

Carpenter, William Benjamen. 1984. *Principles of mental physiology,* 4th edition. New York: Appleton.

Carron, A.B. 1965. "Complex motor skill performance under conditions of externally induced stress." M.A. thesis, University of Alberta.

Chaffin, Roger, Gabriela Imreh, and Mary Crawford. 2002. *Practicing perfection: Memory and piano performance.* Mahwah, NJ: Lawrence Erlbaum.

Clark, L.Verdelle. 1958. "Effect of mental practice on the development of a certain motor skill." Ph.D. diss., Wayne State University.

_____. 1960. "Effect of mental practice on the development of a certain motor skill." *Research Quarterly* 30: 560-69.

Coffman, Don D. 1987a. "The effects of mental practice, physical practice, and aural knowledge of results on improving piano performance." Ph.D. diss., University of Kansas.

_____. 1987b. "The effects of mental practice, physical practice, and knowledge of results on piano performance." *Journal of Research in Music Education* 38, no. 3: 187-96.

Cooke, G. 1964. "The efficacy of two desensitization procedures: An analogue study." *Behavior Research and Therapy*1: 351 -356.

Cooper, Robert K. 1991. *The performance edge: New strategies to maximize your work effectiveness and competitive advantage.* Boston: Houghton Mifflin Company.

Corbin, Charles B. 1972. "Mental practice." In *Ergogenic Aids and Muscular Performance*, ed. W.P. Morgan. New York: Academic Press.

Cowell, Henry. 1926. "The process of musical creation." *American Journal of Psychology* 37, no. 1: 233-36.

Dalloway, Marie. 1992. *Visualization: The master skill in mental training.* Phoenix, AZ: Optimal Performance Institute.

Danskin, David G. and Mark A. Crow. 1981. *Biofeedback: An introduction and guide*. Palo Alto, CA: Mayfield Publishing Company.

Deutsch, Diana. 1982. *The psychology of music.* New York: Academic Press.

Driskell, James E., Carolyn Copper, and Aidan Moran. 1994. "Does mental practice enhance performance?" *Journal of Applied Psychology* 79: 481-92.

Drowatzky, John N. 1975. *Motor learning: Principles and practices.* Minneapolis: Burgess.

Eggleston, Dorothy. 1936. "The relative value of actual vs. imaginary practice in a learning situation." Master's thesis, Columbia University.

Egstrom, Glen H. 1964. "Effects of an emphasis on conceptualizing techniques during early learning of a gross motor skill." *Research Quarterly* 35: 472-81.

Epstein, M. 1980. "The relationship of mental imagery and mental rehearsal to performance of a motor task." *Journal of Sport Psychology* 2: 211-20.

Farah, M.J. and A.F. Smith. 1983. "Perceptual interference and facilitation with auditory imagery." *Perception and Psychophysics* 33: 475-78.

Feltz, Deborah L. and Daniel M. Landers. 1983. "The effects of mental practice on motor skill learning and performance: A meta-analysis." *Journal of Sport Psychology* 5: 25-57.

Finke, Ronald A. 1989. *Principles of mental imagery.* Cambridge, MA: MIT Press.

_____. 1990. *Creative imagery: Discoveries and inventions in visualization.* Hillsdale, NJ: L. Erlbaum Associates.

Freeman, G.L. 1931. "The spread of neuro-muscular activity during mental work." *Journal of General Psychology* 5 (October): 479-93.

Freymuth, Malva Susanne. 1994. “Mental practice: Some guidelines for musicians.” *The American Music Teacher* 43, no. 5 (April/May): 18.

_____. 1999. *Mental practice and imagery for musicians: A practical guide for optimizing practice time, enhancing performance, and preventing injury.* Boulder, CO: Integrated Musician’s Press.

Friedrich, Otto. 1989. *Glenn Gould: A life and variations*. New York: Random House.

Gabbard, Glen O. 1981. “Stage fright: Coping methods and formal treatments.” *The Piano Quarterly* 114*:* 15-16, 18-20.

Gallwey, W. Timothy. 1976. *The inner game of tennis.* New York: Random House, Inc.

Galton, Francis. 1880. “Statistics of mental imagery.” *Mind* 5: 301-18.

Galvan, Mary Grace. 1992. “Kinesthetic imagery and mental practice teaching strategies for the piano principal.” D.M.A. diss., University of Miami.

Galyean, Beverly-Colleene. 1980. “The effects of a guided imagery activity on various behaviors of low achieving students.” *Journal of Suggestive-Accelerative Learning and Teaching* 5: 87-97.

_____. 1983. “Guided imagery in the curriculum.” *Educational Leadership* 40, no. 6 (March): 54-58.

Gawain, Shakti. 1978. *Creative visualization.* San Rafael: New World Library.

Gibson, James Jerome. 1966. *The senses considered as perceptual systems*. Boston: Houghton Mifflin.

Geerlings, Cara J. 1998. “Effect of mental and physical practice on improving keyboard performance.” Master’s thesis, University of Kansas.

Gilbert, Linda M. 1993. *The musician’s guide to positive results in the practice room.* Redondo Beach, CA: Damore Publications.

Gill, Diane L., ed. 1986. *Psychological dynamics of sport.* Champaign, IL: Human Kinetics Publications, Inc.

Goldwag, Elliott, ed. 1979. *Inner balance—the power of holistic healing.* Englewood Cliffs, NJ: Prentice Hall, Inc.

Goodman, David, Robert B. Wilberg, and Ian M. Franks, eds. 1985. *Advances in psychology 27: Differing perspectives in motor learning, memory, and control.* New York: NHPC.

Gordon, Edwin. 1987. *The nature, description, measurement, and evaluation of music aptitudes.* Chicago: GIA.

Gordon, R. 1949. "An investigation into some of the factors that favour the formation of stereotyped images." *British Journal of Psychology* 39: 156-67.

Goss, Susan, Craig Hall, Eric Buckolaz, and G. Fishburne. 1986. "Imagery ability and the acquisition of retention of movements." *Memory and Cognition* 18: 469-77.

Gould, D., R.S. Weinberg, and A. Jackson. 1980. "Effect of mental preparation strategies of muscular endurance." *Journal of Sport Psychology* 2: 329-39.

Gray, Stephen W. 1990. "Effect of visuomotor behavior rehearsal with videotaped modeling on racquetball performance of beginning players." *Perceptual and Motor Skills* 70: 379-85.

Green, Barry and Timothy Gallwey. 1986. *The inner game of music.* Garden City: Doubleday.

Green, Lance B. 1994a. "Developing self-talk to facilitate the use of imagery among athletes." In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 43-58. Amityville, NY: Baywood Publishing Company, Inc.

_____. 1994b. "The use of imagery in the rehabilitation of injured athletes." In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 157-174. Amityville, NY: Baywood Publishing Company, Inc.

Greene, Don, Ph.D. 1998. *Audition success.* New York: Random House.

_____. 2001. *Fight your fear and win.* New York: Broadway Books.

_____. 2002. *Performance success: Performing your best under pressure.* New York: Routledge.

Gudmstad, Julie. 2002. "Anatomy of a yogi: Breathing room." *Yoga Journal* (March/April).

Hale, Bruce D. 1982. "The effects of internal and external imagery on muscular and ocular concomitants." *Journal of Sport Psychology* 4: 379-87.

_____. 1994. “Imagery perspectives and learning in sports performance.” In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 75-96. Amityville, NY: Baywood Publishing Company, Inc.

Hall, Craig, Darlene Schmidt, Marie-Claude Durand, and Eric Buckolz. 1994. “Imagery and motor skills acquisition.” In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 121-34. Amityville, NY: Baywood Publishing Company, Inc.

Hall, Evelyn G. and Elizabeth S. Erffmeyer. 1983. “The effect of visuo-motor behavior rehearsal with videotaped modeling on free throw accuracy of intercollegiate women basketball players.” *Journal of Sport Psychology* 5: 343-46.

Hamann, D.L. 1982. “An assessment of anxiety in instrumental and vocal performances.” *Journal of Research in Music Education* 30, no. 2: 77-90.

Hampson, Peter J. and Peter E. Morris. 1983. *Imagery and consciousness*. New York: Academic Press.

Hampson, Peter J., David Marks, and John T.E. Richardson, eds. 1990. *Imagery: Current developments.* New York and London: Routledge.

Harby, S.F. 1952. *Comparison of mental and physical practice in the learning of a physical skill.* U.S. Navy Instructional Film Research Reports, T.R. No. S.D.C. 269-7-27. Special Devices Center, Port Washington, New York.

Hardy, Lew, Graham Jones, and Daniel Gould. 1996. *Understanding psychological preparation for sport: Theory and practice of elite performers.* Chichester: John Wiley and Sons.

Harris, Dorothy V. 1986. “Relaxation and energizing techniques for regulation of arousal.” In *Applied sport psychology: Personal growth to peak performance,* ed. Jean M. Williams, 185-207. Mountain View, CA: Mayfield Publishing Company.

Harris, Dorothy V. and W.J. Robinson. 1986. “The effects of skill level on EMG activity during internal and external imagery.” *Journal of Sport Psychology* 8: 105-11.

Havas, Kató. 1964. *The twelve lesson course in a new approach to violin playing.* London: Bosworth and Company, Ltd.

_____. 1973. *Stage fright: Its causes and cures, with special reference to violin playing.* London: Bosworth and Company Ltd.

Hecker, J.E. and L.M. Kaczor. 1988. "Application of imagery theory to sport psychology: Some preliminary findings." *Journal of Sport Psychology* 10: 363-73.

Hendricks, Gay and Russell Wills. 1976. *The centering book: Awareness activities for children, parents, and teachers.* New York: Prentice Hall.

Hertz, Gilman W. 1956. "The effectiveness of three methods of instruction in one-hand foul shooting." Ph.D. diss., Indiana University.

Hinder, S.L., K.D. Brandt, B.P. Katz, R.N. French, and T.J. Beckiewicz. 1987. "Performance-related problems among premier violinists." *Medical Problems of Performing Artists* 2: 67-71.

Hird, J.S., D.M. Landers, J.R. Thomas, and J.J. Horan. 1991. "Physical practice is superior to mental practice in enhancing cognitive and motor task performance." *Journal of Sport and Exercise Psychology* 13: 281-93.

Holt, Robert R. 1964. "Imagery: The return of the ostracized." *American Psychologist* 19: 254-264.

Horan, J.J., and J.K. Dellinger. 1974. "'In vivo' emotive imagery: A preliminary test." *Perceptual and Motor Skills* 39: 359-62.

Huffman, Imogene Marie. 1954. "A study of the effects of practice on motor learning." M.M. thesis, University of Colorado.

Ikemi, Y. 1965. "Psychological desensitization in allergic disorders." In *Hypnosis and psychosomatic medicine: Proceedings of the International Congress for Hypnosis and Psychosomatic Medicine*, *Paris, 1965,* ed. J. Lassner, 160-65. Berlin: Springer-Verlag.

Jackson, Susan A. 1992. "Athletes in flow: A qualitative investigation of flow states in elite figure skaters." *Journal of Applied Sport Psychology* 4: 161-80.

Jacobson, Edmund. 1929. *Progressive relaxation: A physiological and clinical investigation of muscular states and their significance in psychology and medical practice.* Chicago: University of Chicago Press.

_____. 1930. "Electrical measurement of neuromuscular states during mental activities I: Imagination of m ovement involving skeletal muscle." *American Journal of Physiology* 91: 567-608.

_____. 1932. "Electrophysiology of mental activities," *American Journal of Psychology* 44: 677-94.

_____. 1957. *You must relax.* 4th edition, revised and enlarged. New York: McGraw-Hill Book Company, Inc.

Jaffe, Dennis T. and David E. Bresler. 1980. "Guided imagery: Healing through the mind's eye." In *Imagery: Its many dimensions and applications,* eds. Joseph Shorr, Gail E. Sobel, Pennee Robin, and Jack A. Connella, 260-302. New York and London: Plenum Press.

Janssen, Jeffrey and Anees A. Sheikh. 1994. "Enhancing athletic performance through imagery: An overview." In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 1-22. Amityville, NY: Baywood Publishing Company, Inc.

Jaremko, Matt E. 1978. "Cognitive strategies in the control of pain tolerance." *Journal of Behavior Therapy and Experimental Psychiatry* 9: 239-44.

Jayne ,Walter Addison. 1925. *The healing gods of ancient civilizations.* New Haven: Yale University Press.

Johnson, B. 1928. "Changes in muscular tension in coordinated hand movements." *Journal of Experimental Psychology* 11: 329-41.

Jones, Graham and Lew Hardy. 1990. "Stress in sport: experiences of some elite performers." In *Stress and performance in sport,* eds. Graham Jones and Lew Hardy, 247-77. Chichester: John Wiley and Sons.

Jones, Graham, S. Hanton, and A.B.J. Swain. 1994. "Intensity and interpretation of anxiety symptoms in elite and non-elite sports performers." *Personal Individual Differences* 17: 657-63.

Jones, John Gerald. 1965. "Motor learning without demonstration of physical practice, under two conditions of mental practice." *Research Quarterly* 36*:* 270-76.

Jørgenson, Harald and Andreas Lehmann. 1997. *Does practice make perfect? Current theory and research on instrumental music practice.* Oslo, Norway: Norges musikkhøgskole.

Jowdy, D.P. and D.V. Harris. 1990. "Muscular responses during mental imagery as a function of motor skill level." *Journal of Sport and Exercise Psychology* 12: 191-201.

Kauffman, Geir. 1984. “Mental imagery in problem solving.” In *International review of mental imagery: Volume I,* ed. Anees A. Sheikh. New York: Human Sciences Press: 23-55.

Kella, John J. 1982. “Fifty years of string teaching.” *Music Educators Journal* 68 (February 1982): 38-67.

Kim, Soo Young. 2003. “The effect of guided imagery and preferred music listening versus guided imagery and silence on musical performance anxiety.” MA Thesis, Texas Women’s University.

Kim, Youngshin. 2004. “The effects of improvisation-assisted desensitization and music-assisted progressive muscle relaxation and imagery on ameliorating music performance anxiety of female college pianists.” PhD diss., University of Kansas.

Kirchenbaum, Daniel S. and Ronald M. Bale. 1980. “Cognitive-behavioral skills in golf: Brain Power Golf.” In *Psychology in sports: Methods and applications*, ed. Richard Suinn, 334-50. Minneapolis, MN: Burgess Publishing Company.

Kohl, Robert M. and Daniel L. Roenker. 1980. “Bilateral transfer as a function of mental imagery.” *Journal of Motor Behavior 12*, no. 3: 197-206.

Kohut, Daniel L. 1985. *Musical performance: Learning theory and pedagogy.* Englewood Cliffs, NJ: Prentice-Hall.

Kolonay, Barbara Jean. 1977. “The effects of visuo-motor behavior rehearsal on athletic performance.” Master’s thesis, Hunter College, The City University of New York.

Korn, Erroll R. 1994. “Mental imagery in enhancing performance: Theory and practical exercises.” In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 201-30. Amityville, NY: Baywood Publishing Company, Inc.

Kukla, Kenneth James. 1976. “The effects of progressive relaxation training upon athletic performance under stress.” Ph.D. diss., Florida State University.

Kunzendorf, Robert, ed. 1991. *Mental imagery.* New York and London: Plenum Press.

Lane, John F. 1980. “Improving athletic performance through visuo-motor behavior rehearsal.” In *Psychology in sports: Methods and applications,* ed. Richard Suinn, 316-320. Minneapolis, MN: Burgess Publishing Company.

Lang, Peter J. 1977. "Imagery in therapy: An information processing analysis of fear." *Behavior Therapy* 8 (1977): 862-86.

_____. 1979a. "A Bio-informational theory of emotional imagery." *Psychophysiology* 16: 495-512.

_____. 1979b. "Emotional imagery and visceral control." In *Clinical applications of biofeedback: Appraisal and status,* ed. R.J. Gatchel and K.P. Price. New York: Pergamon.

Lang, P.J., M.J. Kozak, G.A. Miller, D.N. Levin, and A. McLean. 1980. "Emotional imagery: Conceptual structure and pattern of somato-visceral response." *Psychophysiology* 17: 179-92.

Lang, P.J., D.N. Levin, G.A. Miller, and J.J. Kozak. 1983. "Fear behavior, fear imagery, and the psychophysiology of emotion: The problem of affective response integration." *Journal of Abnormal Psychology* 92: 276-303.

Lanning, Wayne and B. Hisanaga. 1983. "A study of the relationship between the reduction of competition anxiety and an increase in athletic performance." *International Journal of Sport Psychology* 14: 219-27.

Lazarus, Arnold A. 1977.*In the mind's eye: The power of imagery for personal enrichment.* 1st edition. New York: Rawson Associates Publishers.

Leber, William Roger. 1979. "Stimulus familiarity and muscular involvement as determinants of image-produced arousal." Ph.D. diss., Bowling Green State University.

Lee, C. 1990. "Psyching up for a muscular endurance task: Effects of image content on performance and mood state." *Journal of Sport and Exercise Psychology* 12: 66-73.

Lehmann, Andreas C. and Anders Ericsson. 1997. "Expert pianists' mental representation: Evidence from successful adaptation to unexpected performance demands." Third Triennial ESCOM conference: Proceedings Uppsala: Upsalla II p. 165-69.

Lehrer, Phyllis Alpert. 2002. "An introduction to cognitive strategies and skills for practice and performance." In *A symposium for pianists and teachers: Strategies to develop the mind and body for optimal performance.* Dayton, OH: Heritage Music Press.

Lehrer, P.M., N.S. Goldman, and E.F. Strommen. 1990. "A principal components assessment of performance anxiety among musicians." *Medical Problems of Performing Artists* 5, no. 1: 12-18.

Leigh, H. 1978. "Self-control, biofeedback, and change in 'psychosomatic' approach." *Psychotherapy and Psychosomatics* 30: 130-36.

Leunes, Arnold, ed. 2002. *Bibliography on psychological tests used in research and practice in sport and exercise psychology*. Lewiston, NY: E. Mellen Press.

Levin, Joel R., J. Guttmann, and Ann E. McCabe. 1977. "Distinguishing between two covert learning strategies in elementary school children." *American Educational Research Journal* 14, no. 3: 339-42.

Lim, Serene and Louis G. Lippman. 1991. "Mental practice and memorization of piano music." *Journal of General Psychology* 118, no. 1 (January): 21.

Lippman, Louis G. and Serene Lim. 1988. "Use of slow renditions to facilitate piano proficiency in young musicians." *Journal of International Listening*: 133-40.

Lund, Darrel Roy. 1972. "A comparative study of three therapeutic techniques in the modification of anxiety behavior in instrumental performance." Ph.D. diss., University of Utah.

Luthe, Wolfgang, ed. 1965. *Autogenic training.* New York and London: Grune and Stratton.

Luthe, Wolfgang and J.H. Schultz. 1969. *Autogenic therapy: Volume III: Applications in psychotherapy.* Edited by Wolfgang Luthe. New York and London: Grune and Stratton.

Mach, Elyse. 1988. *Great pianists speak for themselves*. New York: Dodd, Mead, and Co.

Machlus, S.D. and R.M. O'Brien. 1988. *Visuo-motor behavior rehearsal and preparatory arousal in improving athletic speed.* Paper presented to the annual meeting of the American Psychological Association, Atlanta, GA.

MacKay, Donald G. 1981. "The problem of rehearsal or mental practice." *Journal of Motor Behavior* 13*:* 274-85.

MacLean, P.D. 1978."A mind of three minds: Educating the triune brain." In *Education and the brain,* eds. J. Chall and A. Mirsky. Chicago: University of Chicago Press.

Mahoney, M.J. 1977. *Cognitive skills and athletics performance*. Paper presented to the 11th Annual Meeting of the Association for Advancement of Behavior Therapy, Atlanta, GA, December.

Mahoney, M.J. and M. Avener. 1977. "Psychology of the elite athlete: An exploratory study." *Cognitive therapy and research* I: 135-42.

Martin, Kathleen A. and Craig R. Hall. 1995. "Using mental imagery to enhance intrinsic motivation." *Journal of Sport and Exercise Psychology* 17: 54-69.

Masters, Robert E.L. and Jean Houston. 1972. *Mind games*. New York: Viking.

Maltz, Maxwell. 2000. *Psycho-Cyberkinetics.* New York: Prentice Hall.

McKay, Matthew, Martha Davis, and Patrick Fanning. 1981. *Thoughts and feelings: The art of cognitive stress intervention.* Oakland, CA: New Harbinger Publications.

McLean, Neil and Alan Richardson. 1994. "The role of imagery in perfecting already learned physical skills." In *Imagery in sports and physical performance*, eds. Anees A. Sheik and Errol R. Korn, 59-74. Amityville, NY: Baywood Publishing Company, Inc.

McMahon, C.E. 1976. "The role of imagination in the disease rocess: Pre-Cartesian history." *Psychological Medicine* 6: 179-184.

Meichenbaum, Donald. 1975. "A self instructional approach to stress management: A proposal for stress inoculation training." In *Stress and anxiety, vol. 1*, ed. C.D. Speilberger and I.G. Sarason. Washington, D.C.: Hemisphere.

_____. 1977. "Cognitive-behavior modification: An integrative approach." New York: Plenum Press.

Mendoza, Dwight and Harvey Wickman. 1978. "'Inner' darts: Effects of mental practice on performance of dart throwing." *Perceptual and Motor Skills* 47: 1195-99.

Miller, Emmett. 1994. "Optimal sports performance imagery." In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 175-82. Amityville, NY: Baywood Publishing Company, Inc.

Minas, S.C. 1978. "Mental practice of a complex perceptual-motor skill." *Journal of Human Movement Studies* 4: 102-7.

Misner, Anne Bosworth. 2001. "Mental practice for pianists: Imagery applications for skill acquisition and performance preparation." M.M. Thesis, University of Texas at Austin

Moran, Aidan P. 1991. *The psychology of concentration in sport performers: A cognitive analysis.* East Sussex, BN: Psychology Press.

Morgan, Robert Owen. 1983. "Mental practice, skill level, and acquisition of motor skill." Ph.D. diss., University of Texas at Austin.

Morgan, William P. 1980. "Selected psychological considerations in sport." In *Psychology in sports: Methods and applications*, ed. Richard M. Suinn, 4-18. Minneapolis, MN: Burgess Publishing Company.

Morris, L.W., M.A. Davis, and C.H. Hutchings. 1981. "Cognitive and emotional components of anxiety: Literature review and a revised worry-emotionality scale." *Journal of Educational Psychology* 73: 541-55.

Morrisett, L.N. 1956. "The role of implicit practice in learning." Ph.D. diss., Yale University.

Murphy, Shane M., Editor. 2005. *The Sport Psych Handbook: A Complete Guide to Today's Best Mental Training Techniques*. Champaign, IL: Human Kinetics Publishers.

Murphy, Shane M. and Douglas P. Jowdy. 1992. "Imagery and mental practice." In *Advances in sport psychology,* ed. Thelma Horn, 221-50. Champaign, IL: Human Kinetics Publications, Inc.

Murphy, Shane M., Douglas P. Jowdy, and S.K. Durtschi. 1989. *Report on the United States Olympic Committee survey on Imagery Use in Sport: 1989.* Colorado Spring, CO: U.S. Olympic Training Center.

Murphy, S.M., R.L. Woolfolk, and A.J. Budney. 1988. "The effects of emotive imagery on strength performance." *Journal of Sport and Exercise Psychology* 10: 334-45.

Neisser, Ulric. 1976. *Cognition and reality*. San Francisco: W.H. Freeman.

_____. 1983. "Toward a skillful psychology." In *The acquisition of symbolic skills,* ed. J.A. Sloboda. New York: Plenum.

Nhãt Hanh, Thích. 1987. *The miracle of mindfulness: A manual on meditation.* Revised edition. Translated by Mobi Ho. Boston: Beacon Press.

Nicklaus, Jack and Ken Bowden. 1974. *Golf my way.* New York: Simon and Schuster.

Nideffer, Robert M. 1971. "Deep muscle relaxation: An aid to diving." *Coach and Athlete* 24: 38.

_____. 1976. “Test of attentional and interpersonal style.” *Journal of Personality and Social Psychology 34*, No. 3 (1976): 394-404.

_____. 1980. “Attentional focus—Self-assessment.” In *Psychology in sports: Methods and applications,* ed. Richard Suinn. Minneapolis, MN: Burgess Publishing Company.

_____. 1981. *The ethics and practice of applied sport psychology.* Ann Arbor, MI: Mouvement Publications.

Nideffer, Robert M. and Roger C. Sharpe. 1978. *Attention control training*. New York: Wyden Books.

Niemann, B.K., R.R. Pratt, and M.L. Maughan. 1993. “Biofeedback training, selected coping strategies, and music relaxation interventions to reduce debilitative musical performance anxiety.” *International Journal of Arts and Medicine* 2, no. 2: 7-15.

Noel, R.C. 1980. “The effect of visuo-motor behavior rehearsal on tennis performance.” *Journal of Sport Psychology* 2: 221-26.

Ornstein, R. 1972. *The psychology of consciousness.* New York: Viking Press.

Oxendine, Joseph B. 1969. “Effect of mental and physical practice on the learning of three motor skills.” *Research Quarterly* 40: 755-63.

_____. 1980. “Emotional arousal and motor performance.” In *Psychology in sports: Methods and applications,* ed. Richard Suinn, 103-11. Minneapolis, MN: Burgess Publishing Company.

_____. 1984. *Psychology of motor learning.* 2nd edition. Englewood-Cliffs, NJ: Prentice-Hall.

Paivio, Allan. 1971. *Imagery and verbal processes.* New York: Holt.

_____. 1985. “Cognitive and motivational functions of imagery in human performance.” *Canadian Journal of Applied Sport Science* 10: 22s-28s.

Paivio, Allan, J.C. Yuille, and P.C. Smythe. 1966. “Stimulus and response abstractness, imagery, and meaningfulness, and reported mediators in paired-associate learning.” *Canadian Journal of Psychology* 20: 362-77.

Paul, G.L. 1966. *Insight vs. desensitization in psychotherapy: An experiment in anxiety reduction*. Stanford University Press.

Perry, H.M. 1939. "The relative efficiency of actual and imaginary practice in five selected tasks." *Archives of Psychology* 34: 5-75.

Phipps, Stephen J. and Chauncey A. Morehouse. 1969. "Effects of mental practice on the acquisition of motor skills of varied difficulty." *Research Quarterly* 40, no. 4: 773-78.

Pierson, Michael Eldon. 1992. "Effects of mental and physical practice on 6th grade beginning band instrumentalists' performance accuracy." Thesis, Virginia Polytechnic Institute and State University.

Porter, Kay and Judy Foster. 1986. *The mental athlete*. Ballantine, 1986.

Powell, Graham E. 1973. "Negative and positive mental practice in motor skill acquisition." *Perceptual and Motor Skills* 37: 312.

Provost, Richard. 1994. *The art and technique of performance.* Chester, NY: Guitar Solo Publications.

Purkel, W. and M.H. Borstein. 1980. "Pictures and imagery both enhance children's long-term and short-term recall." *Developmental Psychology* 16: 153-4.

Raalte, Judy L. and Britton W. Brewer, eds. 2002. *Exploring sport and exercise psychology*. Washington, D.C.: American Psychological Association.

Rainbow, E. 1973. "Instrumental Music: Recent research and considerations for future investigations." *Bulletin of the Council for Research in Music Education* 33: 8.

Reisberg, Daniel. 1992. *Auditory imagery.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Restark, Richard M. 2001. *Mozart's brain and the fighter pilot: Unleashing your brain's potential.* New York, NY: Harmony Books.

Richardson, Alan. 1967a. "Mental practice: A review and discussion." (Part I). *Research Quarterly* 38: 95-107.

_____. 1967b. "Mental practice: A review and discussion." (Part II). *Research Quarterly* 38: 263-73.

_____. 1969. *Mental imagery.* New York: Springer Publishing Company, 1969.

Richardson, John T.E. 1999. *Imagery.* Padstow, UK: Psychology Press.

Riley, E. and K.B. Start. 1960. "The effect of the spacing of mental and physical practices on the acquisition of a physical skill."*Australian Journal of Physical Education* 20: 13-16.

Rishe, Harvey, Eric W. Krenz, Craig McQueen, and Vickie D. Krenz. 1994. "Optimal arousal, stress, and imagery." In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 135-46. Amityville, NY: Baywood Publishing Company, Inc.

Rohwer, William D. and Joan P. Bean. "Sentence affects and noun-pair learning: A developmental interaction during adolescence." *Journal of Experimental Child Psychology* 15, no. 3 (June): 521-33.

Ross, Stewart Lewis. 1985. "The effectiveness of mental practice in improving the performance of college trombonists." *Journal of Research in Music Education* 33: 221-30.

Rubin-Rabson, Grace. 1940a. "Studies in the psychology of memorizing piano music II: A comparison of massed and distributed learning." *Journal of Educational Psychology* 31: 270.

_____. 1940b. "Studies in the psychology of memorizing piano music III: A comparison of massed and distributed learning." *Journal of Educational Psychology* 31*:* 460.

_____. 1941. "Studies in the psychology of memorizing piano music V: A comparison of pre-study periods of varied length." *Journal of Educational Psychology* 32: 101.

Rugg, Harold Ordway. 1963. *Imagination.* New York: Harper and Row.

Ryan, E.D., Blakeslee, T., and D.M. Furst. 1986. "Mental practice and motor skill learning: An indirect test of the neuromuscular feedback hypothesis." *International Journal of Sports Psychology* 17: 60-70.

Ryan, E. Dean and Jeff Simons. 1981. "Cognitive demand, imagery, and frequency of mental rehearsal as factors influencing acquisition of motor skills." *Journal of Sport Psychology* 3, no. 1: 35-45.

_____. 1982. "Efficacy of mental imagery in enhancing mental rehearsal of motor skills." *Journal of Sport Psychology* 2: 35-45.

_____. 1983. "What is learned in mental practice of motor skills." *Journal of Sport Psychology* 5: 419-26.

Sackett, Robert S. 1934. "The influence of symbolic rehearsal upon the retention of a maze habit." *Journal of General Psychology* 10: 376-95.

_____. 1935. "The relationships between amount of symbolic rehearsal and retention of a maze habit." *Journal of General Psychology* 13: 113-28.

Salmon, P. 1990. "A psychological perspective on musical performance anxiety: A review of the literature." *Medical Problems of Performing Artists* 5, no. 2: 77-80.

Samuels, Mike and Nancy Samuels. 1980. *Seeing with the mind's eye.* New York: Random House.

Sautter, F. 1984. "Yogi exercises and breath control." *Getzen Gazette* 21 (June): 3.

Scarf, M. 1980. "Images that heal: A doubtful idea whose time has come." *Psychology Today* (September): 32-46.

Schleser, R., Meyers, A.W., and Montgomery, T. 1980. *A cognitive behavioral intervention for improving basketball performance.* Paper presented to the Association for the Advancement of Behavior Therapy, 18th Annual Convention, New York, NY.

Schmidt, Richard A. 1982. *Motor control and learning: A behavioral emphasis.* Champaign, IL: Human Kinetics.

Schmitz, E.R. 1935. *The capture of inspiration*. New York: E. Weyhe.

Schultz, J.H. and Wolfgang Luthe. 1969. *Autogenic therapy.* New York: Grune and Stratton.

Schwartz, G.E., D.A. Weinberger, and J.A. Singer. 1981. "Cardiovascular differentiation of happiness, sadness, anger, and fear following imagery and exercise." *Psychosomatic Medicine* 43: 343-64.

Schwarz, I.P. 1976. "Practice as meditation." *The Instrumentalist* 30, no. 5 (December): 45-46.

Seashore, Carl E. 1938. *Psychology of music.* New York: McGraw-Hill.

Segal, Sydney Johnson, ed. 1971. *Imagery: Current cognitive approaches*. New York and London: Academic Press.

Shaw, William A. 1938. "The distribution of muscular action potentials during imagining." *Psychological Recreation* 2: 195-216.

_____. 1939. "The relation of muscular action potentials to imagined weight lifting." *Archives of Psychology* 34, no. 243: 5-75.

Sheehan, Peter W. 1972. *The function and nature of imagery.* New York: Academic Press.

_____. 1967. "A shortened form of the Betts' Questionnaire upon Mental Imagery." *Journal of Clinical Psychology* 23: 386-89.

Sheikh, Anees A. and Robert G. Kunzendorf. 1984. "Imagery, physiology, and psychosomatic illness." In *International review of mental imagery: Volume I*, ed. Anees A. Sheikh, 95-138. New York: Human Sciences Press, Inc.

Sheikh, Anees A., Katharina S. Sheikh, and L. Martin Moleski. 1994. "Improving imaging abilities." In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 231-48. Amityville, NY: Baywood Publishing Company, Inc.

Shepard, Roger N. 1978. "Externalization of the image and the act of creation." In *Visual learning, thinking, and communication,* ed. B.S. Randhawa ,133-89. New York: Academic Press.

Shipp, John Arthur. 1986. "A study of metaphysical techniques and principles as used by selected musicians." Ed.D. diss., University of Houston.

Sidnell, R.G. 1981. "Motor learning in music education." In *Documentary report of the Ann Arbor Symposium,* ed. R.A. Choate, 28-35. Reston, VA: Music Educators National Conference.

Simons, Jeff. 2000. "Doing imagery in the field." In *Doing sport psychology*, ed. Mark B. Anderson. Champain, IL: Human Kinetics Publishers, Inc.

Simonton, O. Carl, Stephanie Matthews-Simonton, and T.F. Sparks. 1971. "Psychological intervention in the treatment of cancer." *Psychosomatics* 8: 483-90.

Singer, Robert N. 1980. *Motor learning and human performance,* 3rd edition. New York: MacMillan Publishing Co.

Singer, Jerome. 1966. *Daydreaming*. New York: Random House.

Soukhanov, Anne, ed. 1999. *Encarta world English dictionary*. New York: St Martin's Press.

Spielberger, Charles D., Richard L. Gorsuch, and Robert E. Lushene. 1970. *STAI manual.* Palo Alto, CA: Consulting Psychologists Press, Inc.

Spinelli, Philip R. and Billy A. Barrios. 1980. "Psyching the college athlete: A comprehensive sports psychology training package." In *Psychology in sports: Methods and applications,* ed. Richard Suinn, 344-51. Minneapolis, MN: Burgess Publishing Company.

Start, K.B. 1960a. "Kinesthesia and mental practice." *Research Quarterly* 35: 316-20.

_____. 1960b. "Relationship between intelligence and the effect of mental practice on the performance of a motor skill." *Research Quarterly* 31, no. 4: 644-49.

Start, K.B. and Alan Richardson. 1964. "Imagery and mental practice." *British Journal of Educational Psychology* 34 (June): 280-84.

Stebbins, Richard J. 1968. "A comparison of the effects of physical and mental practice in learning a motor skill." *Research Quarterly* 39: 714-20.

Steel, W.I. 1952. "The effect of mental practice on the acquisition of a motor skill." *Journal of Physical Education* 44: 101-8.

Suinn, Richard M. 1972a. "Behavior rehearsal training for ski racers: Brief report." *Behavior Therapy* 2: 210-12.

_____. 1972b. "Removing emotional obstacles to learning and performance by visuo-motor behavior rehearsal." *Behavior Therapy* 3: 308-10.

_____. 1976. "Visual motor behavior rehearsal for adaptive behavior." In *Counseling methods*, eds. Krumboltz, John D. and Carl E. Thorenson. New York: Rinehart and Winston.

_____. 1980a. Body thinking: Psychology for Olympic champions," in *Psychology in sports: Methods and applications,* ed. Richard M. Suinn, 306-15. Minneapolis: Burgess.

_____. 1980b. "Psychology and sports performance: Principles and applications." In *Psychology in sports: Methods and applications*, ed. Richard M. Suinn, 25-26. Minneapolis: Burgess.

_____. 1985. Imagery rehearsal applications to performance enhancement." *The Behavior Therapist* 8: 155-59.

_____. 1986. *Seven steps to peak performance: The mental training manual for athletes.* Lewiston, NY: Hans Huber Publishers.

_____. 1987. "Psychological approaches to performance enhancement." In *Sport psychology: The psychological health of the athlete*, eds. J. May and M. Asken, 41-57. New York: PMA Publishing.

_____. 1994. "Visualization in sports." In *Imagery in sports and physical performance,* eds. Anees A. Sheikh and Errol R. Korn, 23-42. Amityville, NY: Baywood Publishing Company, Inc.

_____. 2001. "Imagery." In *Handbook of research on sport psychology,* eds. Robert Singer, Milledge Murphey, and L. Keith Tennant, 496-510. 2nd edition. New York: Macmillan Publishing Company.

Suinn, Richard, M. Morton, and H. Brammell. 1980. *Psychological and mental training to increase efficiency in endurance athletes.* Technical Report to Developmental Subcommittee, U.S. Olympic Wome's Athletics.

Sweigard, Lulu E. 1974. *Human movement potential: Its ideokinetic facilitation.* New York: Harper and Row.

Titley, Robert W. 1980. "The loneliness of a long-distance kicker." In *Psychology in sports: Methods and applications*, ed. Richard M. Suinn, 321-27. Minneapolis, MN: Burgess Publishing Company.

Trussell, Ella May.1952. "Mental practice as a factor in the learning of a complex motor skill." Master's thesis, University of California.

Twining, H.M. 1949. "Mental practice and physical practice in learning a motor skill." *Research Quarterly* 20: 432-35.

Twining, William Edward. 1962. "Mental practice as a factor in the learning of a complex motor skill." Master's diss., University of Manchester.

Ulich, E. 1967. "Some experiments in the function of mental training in the acquisition of motor skills." *Ergonomics* 10: 411-19.

Ungerleider, Steven. 1996. *Mental training for peak performance: Top athletes reveal the mind exercises they use to excel.*Rodale Press.

Vandall, R.A., R.A. Davis, and H.A. Clugston. 1943. "The function of mental practice in the acquisition of motor skills." *Journal of General Psychology* 29: 243-50.

Van Gyn, G.H., H.A. Wenger, and C.A. Gaul. 1990. "Imagery as a method of enhancing transfer from training to performance." *Journal of Sport and Exercise Psychology* 12: 366-75.

Vealey, Robin S. 1986. Imagery training for performance enhancement." In *Applied sport psychology: Personal growth to peak performance,* ed. Jean M. Williams, 209-32. Mountain View, CA: Mayfield Publishing Company.

Vedelli, Joel. 1985. "Mental rehearsal in sport." In *Sport psychology: Psychological considerations in maximizing sport performance*, eds. Linda K. Bunker, Robert J. Rotella, and Ann S. Reilly, 256-260. Ann Arbor, MI: McNaughton and Gunn Inc.

Walker, C. Eugene, Ph.D. 2001. *Learn to relax: Proven techniques for reducing stress, tension, and anxiety—Promoting peak performance.* Third Edition. New York: John Wiley and Sons, Inc.

Washburn, Margaret Floy. 1916. *Movement and mental imagery: Outlines of a motor theory of the complexer mental processes.* New York: Houghton Mifflin Co.

Weinberg, Robert S. 1981. "The relationship between mental preparation strategies and motor performance: A review and critique." *Quest* 33: 195-213.

Weinberg, Robert S., Thomas G. Seabourne, and Allen Jackson. 1981a. "Effects of visuo-motor behavior rehearsal, relaxation, and imagery on karate performance." *Journal of Sport Psychology* 3: 228-38.

_____. 1981b. "Effects of visuo-motor behavior rehearsal on state-trait anxiety and performance: Is practice important?" *Journal of Sport Behavior* 5, no. 4: 209-19.

Wenz, Betty J. and Donald J. Strong. 1980. "An application of biofeedback and self-regulation procedures with superior athletes: The fine tuning effect." In *Psychology in sports: Methods and applications*, edited by Richard M. Suinn, 328-33. Minneapolis, MN: Burgess Publishing Company.

Whitaker, Charlotte Sibley. 1984. "The modification of psychophysiological responses to stress in piano performance." Ph.D. diss., Texas Tech University.

Whitaker, Charlotte Sibley and Donald Ray Tanner. 1987. "*But I played it perfectly in the practice room!"* Lanham, MD: United Press of America.

White, K.D., R. Ashton, and S. Lewis. 1979. "Learning a complex skill: Effects of mental practice, physical practice, and imagery ability." *International Journal of Sport Psychology* 10: 71-78.

Whitley, G. 1962. "The effect of mental rehearsal on the acquisition of a motor skill." Ed.D. diss., University of Manchester.

Wickens, D.D. 1938. "The transfer of conditional excitation and conditioned inhibition from one muscle group to the antagonistic muscle group." *Journal of Experimental Psychology* 22: 101-23.

Williams, Jean M., ed. 1986. *Applied Sport Psychology: Personal Growth to Peak Performance.* Palo Alto, CA: Mayfield Publishing Company.

Winning Associates. 1978. *Athlete's homework manual*. Winning Associates: Morgantown, WV.

Wirt, Karl M. 1992. *The effet of m entalpractice on the sightreading skills of junior high school wind instrument performers.* Oswego, NY: State University of New York, College of Arts and Science, Professional Studies Division.

Wolfe, M.L. 1989. "Correlates of adaptive and maladaptive musical performance anxiety." *Medical Problems of Performing Artists* 4, no. 1: 49-56.

Wolpe, Joseph. 1958. *Psychotherapy by reciprocal inhibition.* Stanford, CA: Stanford University Press.

_____. 1973. *The practice of behavior therapy.* 2nd edition. New York: Pergamon Press Inc.

Wolpe, Joseph and Arnold Lazarus. 1966. *Behavior therapy techniques*. Long Island City, NY: Pergamon Press.

Woolfolk, R.L., W. Parrish, and S.M. Murphy. 1985. "The effects of mental rehearsal of task motor activity and mental depiction of task outcome on motor performance." *Journal of Sport Psychology* 7: 191-97.

Wrisberg, C.A. and M.R. Ragsdale. 1979. "Cognitive demand and practice level: Factors in the mental rehearsal of motor skills." *Journal of Human Movement Studies* 5*:* 201-8.

Yuille, John C., ed. 1983. *Imagery, memory, and cognition: Essays in honor of Allan Paivio.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Zecker, Stephen G. 1982. “Mental practice and knowledge of results in the learning of a perceptual motor skill.” *Journal of Sport Psychology* 4: 52-63.

Zi, Nancy. 1986. *The art of breathing: Thirty simple exercises for improving your performance and well-being*. New York: Bantam Books.

APPENDICES

APPENDIX A

OUTLINE OF RESEARCH PROCEDURE

Session One

Informed Consent Form (appendix B)

Pre-tests: Personal Report of Confidence as a Performer (appendix C)

State/Trait Anxiety Inventory (appendix D)

List of goals for final performance (appendix E)

Videotaped performance of all subjects

Introduction to Deep Breathing (appendix G)

Introduction to Progressive Relaxation (appendix H)

Selection of Imagery Scenes (appendix J)

Imagery Exercise (appendix I)

Fill out: Imagery Exercise Worksheet (appendix J)

Hand out: Mental Practice Logs (appendix K) for Week One

Progressive Relaxation Assignments (appendix L): Stages I-III

Self-Evaluations from videotape, Session I (appendix F)

Practice assignments:

Begin progressive relaxation assignments at Stage I (appendix L)

Day 1: Mentally hear while reading score

Day 2: Read through score while hearing mentally and tapping fingers

Day 3: Read through score, hear mentally, and imagine using correct fingering

Session Two

Progressive Relaxation Exercise (appendix H)

Imagery Exercise (appendix I)

Fill out: Imagery Exercise Worksheet (appendix J)

Videotaped performance in front of researcher only

Hand in: Self-evaluations from videotape, Session I (appendix F)

Hand out: Practice logs (appendix K) for Week Two

Stage I Imagery Exercise (appendix M)

Self-evaluations from videotape, Session II (appendix F)

Practice Assignments:

Continue with progressive relaxation at Stage I, II, or III (appendix L)

Stage I Imagery (appendix M)

Day 1: Mentally practice without looking at score, hearing in mind and visualizing keyboard

Day 2: Mentally practice while visualizing score

Day 3: Practice 3 “difficult spots” mentally

Session Three

Progressive Relaxation Exercise (appendix H)

Imagery Exercise (appendix I)

Fill out: Imagery Exercise Worksheet (appendix J)

Videotaped performance for half of the subjects, divided into two groups

Hand in: Self-evaluation from videotape, Session II (appendix F)

Hand out: Practice Logs for Week Three (appendix K)

Stage II Imagery Exercise (appendix M)

Self-evaluation from videotape, Session III (appendix F)

Practice Assignments:

Continue with progressive relaxation at Stage I, II, or III (appendix L)

Stage II Imagery (appendix M)

Detailed mental practice: imagine playing individual sections, starting in the last section while visualizing the score

Session Four

Devise pre-performance routine (appendix J)

End result followed by detailed mental practice

Progressive Relaxation Exercise (appendix H)

Relaxation of four muscle groups

Relaxation without tensing muscles first

Imagery Exercise (appendix I)

Videotaped performance in front of all subjects

Hand in: Self-evaluation from videotape, Session III (appendix F)

Fill in: Imagery exercise worksheet (appendix J)

Hand out: Practice Logs for Week Four (appendix K)

Stage III Imagery (appendix M)

Self-evaluation from videotape, Session IV (appendix F)

Practice Assignments:

Continue with progressive relaxation at Stage I, II, or III (appendix L)

Stage III Imagery (appendix M): Choose one of four procedures for reaching a final goal

Design mental practice sessions on own according to what has been most effective

Session Five

Post-tests: Personal Report of Confidence as a Performer (appendix C)

State/Trait Anxiety Inventory (appendix D)

Progressive Relaxation exercise (appendix H)

Relaxation of four muscle groups

Relaxation without tensing muscles first

Imagery Exercise (appendix I)

Pre-performance routine: End result followed by detailed mental practice

Fill out: Imagery Exercise Worksheet (appendix J)

Videotaped departmental piano recital

Fill out: Final self-evaluation from videotape (appendix F)

Final evaluation (appendix N)

Final Interview

APPENDIX B

INFORMED CONSENT LETTER

Dear University of Oklahoma graduate piano student:

My name is Lesley Sisterhen, and I am a DMA student in the School of Music at the University of Oklahoma. I am currently involved in a study investigating the use of imagery, mental practice, and relaxation techniques in musical performance enhancement. This study is being carried out under the supervision of Dr. Jane Magrath in the School of Music at the University of Oklahoma. I invite you to participate in this research study, the results of which will be the basis of a D.M.A. document. The study will be entitled "The Use of Imagery, Mental Practice, and Relaxation Techniques for Musical Performance Enhancement."

The purpose of the exploratory study is to elicit information about the impact of imagery, mental practice, and relaxation techniques on self-efficacy, regulation of anxiety, concentration level, and stability of memory during performance. Because it is impossible to judge performances in a completely objective way, there will be no quantifiable evidence of performance improvement. Most of the evidence presented in the study will come from the participants themselves, in self-evaluations of their own playing. The study will therefore examine whether the combination of imagery and relaxation techniques has any impact on a musician's own conception of performance success. For the study, participants are to choose a memorized piece that they are currently practicing on a regular basis. The piece should be from three to five minutes long.

Subjects of the study will benefit by gaining an opportunity to perform once per week, learning relaxation techniques to use prior to performance and in everyday life, and possible performance enhancement benefits due to the regular use of mental practice and imagery. Your participation will require you to be involved in the study for four weeks. During this time, you will be expected to engage in relaxation exercises and an individual mental practice/imagery session for 15 to 20 minutes three times per week. You will also attend a group session with the researcher once a week to perform your chosen piece and to participate in a relaxation and imagery session. There will be a total of five sessions, which are expected to last an hour and a half to two hours each. During the last session, participants will perform their pieces in the University of Oklahoma Piano Lab. There are no foreseeable risks associated with this study beyond those present in routine everyday life.

Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time. Participants will remain anonymous, and their real names will not be released when citing the findings. A pseudonym will be used to identify each subject. Each subject will be assigned a pseudonym at Session I. Any reference to subject comments and correlation with pre- and post-test scores will be identified in the final

document by pseudonyms. Subjects will not be made aware of their own or other subjects' pseudonyms so that they will not be able to identify other subjects through any comments in the final document.
All performances will be videotaped so that participants can later self-evaluate their performances by watching the videotape. Participants have the right to refuse to allow such videotaping without penalty. All videotapes will be erased at the conclusion of the study. Please select one of the following options:

___I consent to the use of video recording.

___I do not consent to the use of video recording.

The findings from this project will provide information on the performance enhancement benefits of regular use of relaxation, mental practice, and imagery.

If you have any questions about this project, please feel free to call me at (405) 974-5657 or e-mail atlsisterhen@ou.edu . You may also contact my faculty sponsor, Dr. Jane Magrath, either by phone at (405) 325-4681 or by e-mail atjmagrath@ou.edu if you have any further questions. Questions about your rights as a research participant or concerns about the project should be directed to the Institutional Review Board at the University of Oklahoma-Norman Campus at (405) 325-8110 or irb@ou.edu.

I have read and understand the terms and conditions of this study and I hereby agree to participate in the above-described research study. I understand my participation is voluntary and that I may withdraw at any time without penalty.

_____ _____

Signature of Participant Date

_____

Printed Name of Participant

_____

Researcher Signature

APPENDIX C

PERSONAL REPORT OF CONFIDENCE AS A PERFORMER (PRCP)

Developed by Appel (1974)

This questionnaire is composed of 30 items regarding your feelings of confidence as a solo performer on the piano. After each statement there is a "True" and a "False." Try to decide whether "True" or "False" *most* represents your feelings as associated with your most *recent* solo performance. Then put a *circle* around the "T" or "F." On this part of the study, the information is completely confidential and will not be made known to anyone except the researcher. Work quickly—*first impressions* are most appropriate. Please respond to every statement.
Name_____

1.	I look forward to an opportunity to perform in public.	T	F*
2.	My legs tremble when I reach for the pedal.	T	F
3.	I am in constant fear of forgetting the music.	T	F
4.	Audiences seem friendly when I come on stage.	T	F
5.	While preparing a solo performance I am in a constant state of anxiety.	T	F
6.	At the conclusion of a performance I feel that I have had a pleasant experience.	T	F
7.	I dislike to use my body expressively.	T	F
8.	My thoughts become jumbled and confused when I perform before an audience.	T	F
9.	I have no fear of facing an audience.	T	F
10.	Although I am nervous just before getting up I soon forget my fears and enjoy the performance.	T	F
11.	I face the prospect of performing with complete confidence.	T	F
12.	I feel that I am in complete possession of myself while performing.	T	F
13.	I prefer to have the score on the piano in case I forget the music.	T	F

14.	I like to observe the reactions of the audience to my performance.	T	F
15.	Although I perform well before friends I freeze on the stage.	T	F
16.	I feel relaxed and comfortable while performing.	T	F
17.	Although I do not enjoy performing in public I do not particularly dread it.	T	F
18.	I always avoid playing solos in public if possible.	T	F
19.	The faces of the audience are blurred when I look at them.	T	F
20.	I feel disgusted with myself after performing before an audience.	T	F
21.	I enjoy preparing for a solo performance.	T	F
22.	My mind is clear when I face an audience.	T	F
23.	My hands feel cold and weak before performing.	T	F
24.	I perspire and tremble just before performing.	T	F
25.	My posture feels strained and unnatural.	T	F
26.	I am fearful and tense all the while I am performing before an audience.	T	F
27.	I find the prospect of performing mildly pleasant.	T	F
28.	At the conclusion of my performance I feel that I would like to continue performing.	T	F
29.	I am terrified at the thought of performing before a group of people.	T	F
30.	I have a feeling of alertness in facing an audience.	T	F

*A circled answer indicates a sign of anxiety.

APPENDIX D

STATE/TRAIT ANXIETY INVENTORY (STAI)
SELF-EVALUATION QUESTIONNAIRE

Developed by C.D. Spielberger, R.L. Gorsuch and R. Lushene (1970)

STAI FORM X-1

Name_____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate *how you feel right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1= not at all 2=somewhat 3=moderately so 4=very much so

1.	I feel calm	1	2	3	4
2.	I feel secure	1	2	3	4
3.	I am tense	1	2	3	4
4.	I am regretful	1	2	3	4
5.	I feel at ease	1	2	3	4
6.	I feel upset	1	2	3	4
7.	I am presently worrying over possible misfortunes	1	2	3	4
8.	I feel rested	1	2	3	4
9.	I feel anxious	1	2	3	4
10.	I feel comfortable	1	2	3	4
11.	I feel self-confident	1	2	3	4
12.	I feel nervous	1	2	3	4
13.	I am jittery	1	2	3	4
14.	I feel “high strung”	1	2	3	4

15.	I am relaxed	1	2	3	4
16.	I feel content	1	2	3	4
17.	I feel worried	1	2	3	4
18.	I feel over-excited and “rattled”	1	2	3	4
19.	I feel joyful	1	2	3	4
20.	I feel pleasant	1	2	3	4

SELF-EVALUATION QUESTIONNAIRE
STAI FORM X-2

Name:_____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

1=almost never 2=sometimes 3=often 4=almost always

21.	I feel pleasant	1	2	3	4
22.	I tire quickly	1	2	3	4
23.	I feel like crying	1	2	3	4
24.	I wish I could be as happy as others seem to be	1	2	3	4
25.	I am losing out on things because I can't make up my mind soon enough	1	2	3	4
26.	I feel rested	1	2	3	4
27.	I am "calm, cool, and collected"	1	2	3	4
28.	I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29.	I worry too much over something that really doesn't matter	1	2	3	4
30.	I am happy	1	2	3	4
31.	I am inclined to take things hard	1	2	3	4
32.	I lack self-confidence	1	2	3	4
33.	I feel secure	1	2	3	4
34.	I try to avoid facing a crisis or difficulty	1	2	3	4
35.	I feel blue	1	2	3	4

36.	I am content.....	1	2	3	4
37.	Some unimportant thought runs through my mind and bothers me	1	2	3	4
38.	I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39.	I am a steady person.....	1	2	3	4
40.	I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

APPENDIX E

LIST OF GOALS FOR THE FINAL PERFORMANCE

Name:_____

Please choose three of the following goals that you hope to have achieved by the time you give your final performance in this study. Circle the three goals. If possible, write specific comments under each of the goals. The more specific these comments are, the more helpful they will be! These comments might include such aspects as a specific spot or section of the piece, what type of character you are aiming for, what is meant by "musicality," or whatever seems most important to you about your piece and your playing. You may list more than one goal under one topic; for example, there may be three spots where you would like to have technical fluency, and these could be your three performance goals.

Accuracy

Solid memory

Musicality
Examples: balance, phrasing, dynamic intensity

Character

Technical fluency

Connection to audience

Concentration

Confidence

Other:

APPENDIX F

SELF-EVALUATION OF VIDEOTAPED PERFORMANCE

Name:_____

Session: (circle one) I II III IV V

1. How would you rate your overall performance today, on a scale of 1-10?_____

2. How would you rate these specific areas of your performance, on a scale of 1-10?

   Accuracy _____
   Concentration _____
   Memory _____
   Confidence _____
   Musicality _____

3. Did you notice anything in the videotape that you did not notice while you were playing? It may be related, for instance, to your own body movement or how the piece came across to the audience (for example, pacing, dynamic intensity, or musicality).
   Circle one: Y N

   If so, what was it?

4. What areas needed improvement? Describe them in detail.

5. What areas were especially good about your performance? Describe them in detail, as well.

6. Please write any other comments that you have about your performance or the impact of watching it on videotape.

APPENDIX G

DEEP BREATHING SCRIPT FOR SESSION I

Deep breathing should always accompany relaxation techniques. It should also be used prior to performance as a way to calm the body and focus the mind. In addition to its calming effect, deep breathing also facilitates performance by increasing the amount of oxygen in the blood, and thus carrying more energy to the muscles. Many people use only shallow breathing in their daily life, and breathe from high in their chests rather than in their diaphragms. Under conditions of stress, the breathing pattern is often further disrupted. Performers may hold their breath or breathe rapidly and shallowly from the upper chest. When tense or guarded, people may first hold the breath and then take fast, shallow breaths. Relaxed breathing is slower and softer, and has a steady, even pattern.

Learning to take a slow, deep breath usually triggers a relaxation response. Musicians can use deep breathing in their daily life, in addition to using it while involved in imagery rehearsal. In the minutes before walking onstage prior to a performance, deep breathing can help those who are anxious and tense about the upcoming performance by lowering their arousal level. Deep breathing can also be used before beginning a practice session. Today you will learn the technique of deep, diaphragmatic breathing, which will be used prior to physical and mental sessions and imagery rehearsal.

To feel the action of the diaphragm, lie on your back. The belly needs to be completely soft and relaxed, so it may be helpful to put some support under your

knees. Now place your hands on your belly and feel the movement of your breath. In relaxed, diaphragmatic breathing, your hands should softly lift on the inhalation. As the diaphragm relaxed, it returns to its dome shape and the belly softly drops.

In order to take a full breath, the diaphragm and several accessory muscles must work together to expand the rib cage in all directions. To feel this, let's stand. Put your hands together in front of your stomach, around your lower ribs, about three to four inches above where you normally would put a belt. As you inhale, feel the stomach expand as the rib cage opens up and out. The rib cage will also open to the side, and as the breath moves into the chest, your shoulders will lift slightly. As you exhale and the rib cage compresses, you can feel the stomach contract inward; if a belt were around your stomach, it would be tightening. Let's just practice breathing in and out, feeling the rib cage expanding on the inhale. The breath will move through the stomach, ribs, and then into the chest.

Now on the next inhale, imagine that the lungs are divided into three different levels. As you inhale through the nose, the lower section is filled with air and the abdomen is forced out. You will then expand the chest cavity and raise the rib cage and chest as the middle section fills with air. Finally, fill the upper portion of the lungs by raising the chest and shoulders slightly. Exhaling through the mouth involves pulling the abdomen in and lowering the shoulders and chest to empty the lungs.

Feel free to move or alter your position when you want to be comfortable. The purpose is to relax and let go, rather than staying perfectly still. Relaxed, slow, and smooth breathing is accompanied by relaxation of the nervous system. You can

use deep breathing to facilitate relaxation, and you can also use it to develop focus. When you are breathing in this time, I am going to count to five on the inhale, and five on the exhale. Concentrate on mentally counting to maintain a slow, steady, and even pace. (Breathe three times.) Now on the next breath in, I will count to five on the inhale and six on the exhale, and we will hold the inhale for two counts. (Breathe three times) Now, I'm going to count to six on the inhale, and on the exhale, allow yourself to think of the word "calm" while I count to seven. Imagine all distracting thoughts being expelled as you breathe out.

APPENDIX H

PROGRESSIVE RELAXATION GROUP SESSION SCRIPTS

Session I

A. Progressive Relaxation

During the first session, the researcher will describe the rationale behind using progressive relaxation and explain its basic procedures. Subjects will then participate in a progressive relaxation session in which they will tense and relax each muscle group twice in sequential order. All of the following scripts were modified from the scripts in Chapter 5 of *Progressive Relaxation Training: a Manual for the Helping Professions* (Bernstein and Borkovec 1973, 19-23). The 16-step basic procedure will be used, with the muscle groups dealt with in the following order:

1. Dominant hand and forearm
2. Dominant biceps
3. Nondominant hand and forearm
4. Nondominant biceps
5. Forehead
6. Upper cheeks and nose
7. Lower cheeks and jaws
8. Neck and throat
9. Chest, shoulders, and upper back

10. Abdominal or stomach region

11. Dominant thigh

12. Dominant calf

13. Dominant foot

14. Nondominant thigh

15. Nondominant calf

16. Nondominant foot

Session I: Introduction and Rationale Script

The procedures we will be using to induce relaxation prior to practice, performance, and imagery are collectively called Progressive Relaxation Training. They were first developed in the 1930s by a physiologist named Edmond Jacobson, and in recent years his original technique has been modified in order to make it simpler and more effective. Basically, progressive relaxation consists of learning to sequentially tense and then relax various groups of muscles all through the body, while at the same time paying very close and careful attention to the feelings associated with both tension and relaxation. That is, in addition to teaching you how to relax, I will also be encouraging you to recognize and pinpoint tension and relaxation as they appear in everyday situations as well as in our sessions here.

You should understand that learning relaxation skills is very much like learning any other kind of skill such as swimming or riding a bicycle. In order for you to get better at relaxing you will have to practice doing it just as you would have to practice other skills. It is very important that you realize that progressive

relaxation training involves learning on your part; there is nothing magical about the procedures. I will not be doing anything to you; I will merely be introducing you to the technique and directing your attention to various aspects of it, such as the presence of certain feelings in the muscles. So without your active cooperation and regular practicing of the things you will learn today, the procedures will not be of much use.

Now I mentioned earlier that I will be asking you to tense and then relax various groups of muscles in your body. You may be wondering why, if we want to produce relaxation, we start off by producing tension. The reason is that, first of all, everyone is always at some level of tension during his waking hours; if a person were not tense to some extent, they would simply fall down. The amount of tension actually present in everyday life differs among individuals. Each person has reached some adaptation level—the amount of tension under which he or she operates every day.

The goal of progressive relaxation training is to help you learn to reduce muscle tension in your body far below your adaptation level at any time. In order to accomplish this, you would focus your attention, for example, on the muscles in your right hand and lower arm and then just let them relax. Now you might think you can let these muscles drop down below their adaptation level just by "letting them go," and to a certain extent, you probably can. However, in progressive relaxation, we want you to learn to produce larger and more noticeable reductions in tension. The best way to do this is first to produce a good deal of tension in the muscle group, and then, all at once, release that tension. The effect is like that which we could produce

with a pendulum which is hanging motionless in a vertical position. If we want it to swing far to the right, we could push it quite hard in that direction. It would be much easier, however, to start by pulling the pendulum in the opposite direction and then letting it go. It will swing well past the vertical point and continue in the direction we want it to go.

Tensing muscle groups prior to letting them relax is like giving ourselves a "running start" toward deep relaxation through the momentum created by the tension release. Another important advantage to creating and releasing tension is that it will give you a good chance to focus your attention on the tension and become clearly aware of what it really feels like in each of the various groups of muscles we will be dealing with. In addition, the tensing procedure will make a vivid contrast between tension and relaxation and will give you an excellent opportunity to directly compare the two and appreciate the difference in feeling associated with each of these states.

Do you have any questions about what I've said so far? (Answer any questions about the rationale behind relaxation training but defer questions about specific procedures until the following material has been covered.)

Now the purpose of this first session is to help you learn to become deeply relaxed, perhaps more relaxed than you've ever been before, and we can begin this session by going over the muscle groups that we're going to be dealing with in relaxation training. At this point in training, there are sixteen muscle groups to be dealt with which are tensed and relaxed. As your skill develops, the number of groups will be reduced.

Now there are some points I would like to make about this procedure before we begin. I'm going to be asking you to pay very careful attention to the feelings of relaxation that appear in the various muscle groups and since we'll be starting with the right hand and right lower arm I'm going to use that as a reference point against which to compare the next muscle group. For example, when we're working on the right biceps I'll ask you a question like "Does the right hand biceps feel as relaxed as the right hand and right lower arm?" This way we can be assured that each muscle group gets as deeply relaxed as the one prior to it.

Please do not tense your muscles until I indicate that you should begin by saying the word "now." Another important point to remember is that I will expect you to release the tension that you build up in these muscle groups immediately upon my cue. Please don't let the tension dissipate gradually.

Once we have relaxed a group of muscles there is some advantage in not moving that group of muscles. I'll ask you not to move from your position unnecessarily; however, you may feel free to move in any way that helps you to continue to maintain a comfortable position at all times. Do not be afraid to move, but do not make any unnecessary movements during the session.

I am also going to ask you not to talk to me during this session; we will communicate by means of hand signals on your part. For example, if I ask you to signal that the right hand and right lower arm are complete relaxed, you should signal this to me just by lifting the little finger of the hand that is closest to me. Not signaling would indicate to me that there is some tension still remaining.

I expect this first session to take about 40-45 minutes to complete. Please remove any constraints such as watches or tight rings. Also take off your eye glasses and if you have contact lenses in, these should be removed if possible.

Do you have any further questions at this point? (Answer all pertinent questions). Okay, now I'm going to ask you to lie down on the floor and I will dim the lights in the room so that we can effectively cut down external stimulation. We can now begin. Just close your eyes, keep them closed throughout the session, and get into a good comfortable position in the chair.

II. Relaxation Training Script

We will begin training with the hand and forearm. You will begin by using your dominant side; for those of you who are right-handed, you will begin with the right hand and lower right arm. For those of you who are left-handed, you will begin with the left hand and lower left arm. Now I would like you to focus all of your attention on the muscles of your dominant hand and lower arm. By making a tight fist, tense the muscles now. You should be able to feel tension in the hand, over the knuckles, and up into the lower arm. (Hold 5-7 seconds) Feel the muscles pull; notice what it's like to feel tension in these muscles as they pull and remain hard and tight. Okay, now relax that group of muscles. Just let these muscles go, noticing the difference between tension and relaxation, focusing on the feeling in this muscle group as it becomes more and more relaxed. (30-40 seconds) Again I'd like you to tense the muscles in the dominant hand and lower arm, now. (5-7 seconds) Now relax. (45-60 seconds) Just recalling what it was like when you released these

muscles, just letting them go and allowing them to become more and more deeply relaxed.

We will now move to the dominant muscles of the biceps. Tense these muscles by pushing your elbow down into the side of your body. You should be able to get a feeling of tension in the biceps without involving the muscles in the lower arm and hand. (5-7 seconds) Now relax the muscles (30-40 seconds). Just let your muscles go, thinking about nothing but the very pleasant feelings of relaxation. Let all the tension go, focusing on these muscles as they just completely relax, focusing all your attention on the feelings associated with relaxation. Now tense the dominant biceps again (5-7 seconds). Now relax these muscles (45-60 seconds). Focus all your attention on the feelings associated with relaxation flowing into these muscles. If the muscles of the dominant biceps are as deeply relaxed as the muscles of the dominant hand and forearm, please signal to me by lifting your finger.

All right, now that we've completed the relaxation of the dominant hand and lower arm and the biceps, we'll move over to the muscles of the other hand and lower arm. By making a tight fist, tense the muscles in the nondominant hand and forearm now (5-7 seconds). Now relax (30-40 seconds). Just enjoy the feelings in the muscles as they loosen up, smooth out, unwind, and relax more and more deeply. Now tense again. (5-7 seconds). Now relax (45-60 seconds). Just experience the sensations of deep, complete relaxation flowing into these muscles; more and more deeply and completely relaxed. If the nondominant hand and forearm are as deeply relaxed as the dominant hand and forearm, please signal this to me by lifting your little finger.

We will now move to the nondominant biceps. Tense your nondominant biceps by pushing your elbow down into the side of your body (5-7 seconds). Now relax (30-40 seconds). Letting all the tension go, focusing on these muscles as they just relax completely, noticing what it feels like as the muscles become more and more relaxed. Now tense again (5-7 seconds). Now relax again (45-60 seconds). Focus all your attention on the feelings associated with relaxation flowing into these muscles. If the nondominant biceps are as relaxed as the nondominant hand and forearm, indicate this to me by lifting your little finger.

Now that we've relaxed the arms and hands, we'll relax the muscles of the face, and for conceptual purposes we're going to divide the facial muscles into 3 groups: first the muscles in the forehead, or the upper part of the face, then the muscles in the central part of the face (the upper part of the cheeks and the nose), and finally the lower part of the face (the jaws and the lower part of the cheeks). We'll begin with the muscles in the upper part of the face. You will tense these muscles by lifting the eyebrows just as high as you can and getting tension in the forehead and up into the scalp region. Now tense these muscles. (5-7 seconds). And relax, letting all the tension go, focusing on these muscles as they just relax completely, noticing what it feels like as the muscles become more and more relaxed (30-40 seconds). Now tense them again (5-7 seconds). Now once again relax these muscles (45-60 seconds). Focus all your attention on the feelings associated with relaxation flowing into these muscles; just enjoying the pleasant feelings of relaxation, as the muscles go on relaxing more and more deeply, more and more completely. If the forehead is as relaxed as the nondominant biceps, signal to me by lifting your finger.

Now we'll move down to the muscles in the central part of the face, and in order to tense these muscles, you will squint your eyes very tightly and at the same time wrinkle up your nose and get tension through the central part of the face. Now tense these muscles (5-7 seconds). Now relax the facial muscles (30-40 seconds). There's nothing for you to do but focus your attention on the very pleasant feelings of relaxation flowing into this area. Just notice what it's like as the muscles become more and more deeply relaxed. Now tense these muscles again (5-7 seconds). Now relax them again (45-60 seconds). Just enjoy the feelings in the muscles as they loosen up, smooth out, unwind, and relax more and more deeply. Just experience the sensations of deep, complete relaxation flowing into these muscles; more and more deeply and completely relaxed. If the central part of the face is as relaxed as the forehead, signal to me. Next we'll tense the muscles in the lower part of the face. To do this, you will bite your teeth together and pull the corners of your mouth back. You should feel tension all through the lower part of the face and the jaw. Now tense this area (5-7 seconds). Now relax (30-40 seconds). Just let your muscles go, thinking about nothing but the very pleasant feelings of relaxation. Let all the tension go, focusing on these muscles as they just completely relax, focusing all your attention on the feelings associated with relaxation. Now tense this area again (5-7 seconds). And now you may relax (45-60 seconds). Just let those muscles go and notice how they feel as compared to before. Notice how those muscles feel when so completely relaxed. If the lower part of the face is as relaxed as the central part of the face, signal to me.

We've completed the facial muscles, so we'll move on to relax the muscles of the neck. In order to do this I'm going to ask you to pull your chin downward toward your chest and at the same time try to prevent it from actually touching the chest. That is, I want you to *counterpose* the muscles in the front part of the neck against those of the back part of the neck. You should feel just a little bit of shaking or trembling in these muscles as you tense them. Now begin to tense the muscles of the neck (5-7 seconds). Now relax the neck (30-40 seconds). Pay attention only to the sensations of relaxation as the relaxation process takes place. Calm, peaceful and relaxed. Now begin to tense these muscles again (5-7 seconds). And relax this area (45-60 seconds). Let all the tension go and focus on the muscles relax completely, just enjoying the pleasant feelings of relaxation. Notice the muscles go on relaxing more and more deeply, more and more completely. If the neck is as completely relaxed as the facial muscles, signal to me.

We'll then move to the muscles of the chest, the shoulder and the upper back. We're going to combine quite a few muscles here and I'll ask you to tense these muscles by taking a deep breath, holding it, and at the same time pulling the shoulder blades together; that is, pull the shoulders back and try to make the shoulder blades touch. You should feel significant tension in the chest, the shoulders, and the upper back. Now tense this area (5-7 seconds). Now relax. (30-40 seconds) Just let those muscles go and notice how they feel now as compared to before. Pay attention only to the sensations of relaxation as the relaxation process takes place. There's nothing for you to do but focus your attention on the very pleasant feelings of relaxation flowing into this area. Now tense the chest, shoulders, and back again (5-7 seconds).

Now you may relax this area (30-40 seconds). If the chest, shoulders, and back, are as relaxed as the neck, signal to me.

Now we'll move on to the muscles of the abdomen and in order to tense the muscles in this region, you will make your stomach hard; just tense it up as though you were going to hit yourself in the stomach. You should feel a good deal of tension and tightness in the stomach area now. Tense the abdomen now (5-7 seconds). Relax the muscles now (30-40 seconds). Let all the tension go, focusing on these muscles as they just relax completely, focusing all your attention on the feelings associated with relaxation flowing into these muscles. Now tense the area again (5-7 seconds). Now you may relax the abdomen (45-60 seconds). Just enjoy the pleasant feelings of relaxation, as the muscles go on relaxing more and more deeply, more and more completely. If the abdomen is as relaxed as the chest, signal to me.

After relaxing the muscles in the stomach area, we'll move on to the muscles of the legs and feet, and we'll begin with the dominant upper leg, the thigh, and I'll ask you to tense the muscles by counterposing the one large muscle on top of the leg with the two smaller ones underneath; you should be able to feel that large muscle on top get quite hard. Tense the thigh now (5-7 seconds). Now relax this area (30-40 seconds). Just notice what it's like as the muscles become more and more deeply relaxed; just enjoy the feelings in the muscles as they loosen up, smooth out, unwind, and relax more and more deeply. Now tense the thigh again (5-7 seconds). Now you may relax it again (45-60 seconds). Just experience the sensations of deep, complete relaxation flowing into these muscles; more and more deeply and completely relaxed.

Just let them go, thinking about nothing but the very pleasant feelings of relaxation. If the thigh is as relaxed as the abdomen, signal to me.

We will now move on to the muscles of the dominant calf, the dominant lower leg. To tense these muscles, pull the toes upward toward your head. You should be able to feel tension all through the calf area. Now tense your dominant calf (5-7 seconds). Now relax (30-40 seconds). Just let those muscles go and notice how they feel as compared to before. Notice how those muscles feel when so completely relaxed. Now tense the calf again (5-7 seconds). Now relax it again (45-60 seconds). Pay attention only to the sensations of relaxation as the relaxation process takes place. Calm, peaceful, and relaxed. If the calf is as relaxed as the thigh, please signal.

Now we'll move on and tense the muscles of the dominant foot, and in order to do this I'll ask you to point the toe, turn the foot inward, and at the same time curl your toes. You don't need to tense these muscles very hard, just enough to feel the tightness under the arch and in the ball of the foot. Now tense the foot (5-7 seconds). Now relax (30-40 seconds). Let all the tension go, focusing on these muscles as they just relax completely, noticing what it feels like as the muscles become more and more relaxed. Now tense this area again (5-7 seconds). Now relax the foot (45-60 seconds). Focus all your attention on the feelings of relaxation flowing into these muscles; just let those muscles go and notice how they feel now as compared to before. If the foot is as relaxed as the calf, signal that by lifting your finger.

We'll move to the muscles of the nondominant upper leg and tense and relax those muscles just as we did on the right side. Tense the nondominant upper leg now, counterposing the large muscle with the two smaller ones (5-7 seconds). Now relax

(30-40 seconds). Just enjoy the pleasant feelings of relaxation, as the muscles go on relaxing more and more deeply, more and more completely. Now tense the thigh again (5-7 seconds). Now relax it (45-60 seconds). There's nothing for you to do but focus your attention on the very pleasant feelings of relaxation flowing into this area. Calm, peaceful, and relaxed. Pay attention only to the sensations of relaxation. If the nondominant thigh is as relaxed as the dominant thigh, signal to me.

Now we are going to tense the muscles of the nondominant lower leg, again using the same procedures as we used on the right side. Now tense by pulling the toes upward toward your head (5-7 seconds). Now relax (30-40 seconds). Just notice what it's like as the muscles become more and more deeply relaxed, enjoying the feelings in the muscles as they smooth out, unwind, and relax more and more deeply. Now tense the lower leg again (5-7 seconds). Now relax (45-60 seconds). Experience the sensations of deep, complete relaxation flowing into these muscles; more and more deeply and completely relaxed. Focus your attention on the feelings of relaxation flowing into the muscles. If the nondominant lower leg is as relaxed as the dominant lower leg, please signal.

Finally we will tense the nondominant foot, tensing it and relaxing it just as we did on the other side by pointing the toe, turning the foot inward, and curling your toes. Now tense the foot (5-7 seconds). Now relax it (30-40 seconds). Just let those muscles go, thinking about nothing but the very pleasant feelings of relaxation. Now tense it again (5-7 seconds). Now relax one last time (45-60 seconds). Notice how those muscles feel when so completely relaxed. Pay attention only to the sensations

of relaxation. Calm, peaceful, and relaxed. If the nondominant foot is as relaxed as the dominant foot, please signal.

Session II

During Session II, subjects will go through the exact same progressive relaxation process as in Session One, but they will tense and relax each of the sixteen muscles groups only once. The Progressive Relaxation script from Session One will be read, but the repetition of tensing and relaxing each muscle group will be eliminated.

Session III

During Session III, subjects will go through a similar relaxation process, but the number of muscle groups tensed and relaxed will be reduced from sixteen to seven. The muscle groups will be addressed in the following order:

1. Dominant arm: Combine hand, lower arm, and biceps.

The participant will tense the dominant arm by holding the arm out in front of the body with the elbow bent about 45 degrees and making a fist.

2. Nondominant arm: Combine hand, lower arm, and biceps (using the same tensing procedure as above).

3. Facial muscle groups

The three groups are combined by simultaneously performing all three tension procedures: raising the eyebrows, squinting the eyes, wrinkling the nose, biting down, and pulling the corners of the mouth back.

4. Neck and throat

This area will be tensed in the same way that it was in the first session, by pulling the chin downward but preventing it from touching the chest.

5. Chest, shoulders, upper back, and abdomen

Participants will achieve tension by taking a deep breath, holding it, and pulling the shoulder blades back and together, while at the same time making the stomach hard by pulling it in.

6. Dominant thigh, calf, and foot

Tension is produced by lifting the leg slightly while pointing the toes and turning the foot inward.

7. Nondominant thigh, calf and foot (using the same tensing procedure as above)

Session IV

In the fourth session, subjects will go through two progressive relaxation routines. The first will involve only four muscle groups, so that the number of muscle groups has been reduced from seven. The second routine will enable the participants to use a recall procedure in achieving relaxation. It is this

recall procedure that subjects will be advised to use immediately prior to their performance at the recital.

Relaxation procedures for four muscle groups will use the following sequential order of tensing and relaxing:

1. muscles of the left and right arms, hands, and biceps

The previous tensing strategies will be combined: subjects will lift both arms off the floor and bend them at the elbow while clenching the fists.

2. muscles of the face and neck

To get tension in this area, participants will tense all of the facial muscles while at the same time tensing the neck by pulling the chin down.

3. muscles of the chest, shoulders, back, and abdomen

This muscle group is the same as that found in the seven-group stage. Participants will tense the group by pulling the shoulder blades together.

4. muscles of the left and right upper leg, calf, and foot

Tension will be attained by combining the tension procedures used when tensing each leg separately: lifting the leg slightly while pointing the toes and turning the foot inward.

Relaxation with recall employs the same four muscle groups which were employed in the previous procedure, but during this routine, only two sequential events will take place: first, the careful focusing of the subject's attention on any tension in a particular muscle group; and second, the instruction to recall the feelings associated with release of that tension. Therefore, the production of tension will be eliminated.

Participants will go through the relaxation with recall routine by following the order of the four muscle groups. For example, in the first step, the researcher will ask them to: "Focus all of your attention on the muscles of the arms and hands and very carefully identify any feelings of tightness or tension that might be present there now. Notice where this tension is and what it feels like." They will then be directed to go into the relaxation mode in the following way: "And now relax, just recalling what it was like when you released these muscles, just letting them go and allowing them to become more and more deeply relaxed." This step will last for 30-45 seconds. The participants will be directed to use relaxation through recall again before the performance at Session V.

Session V

Prior to the final performance in Session V, participants will engage in a progressive relaxation routine that uses relaxation with recall. They will follow the same procedure as used in Session V, but without first tensing the four muscle groups.

APPENDIX I

IMAGERY GROUP SESSION SCRIPTS

The following scripts will be used in the group sessions to train the participants in the use of guided imagery as preparation for performance. The scripts are modified versions of the instructions for VMBR given by Richard Suinn in Chapter Two of *Imagery in Sports and Physical Performance,* "Visualization in Sports" (Suinn, 1994).

Session One

At the first group session, participants will engage in an imagery exercise after they have been introduced to deep breathing and progressive relaxation. For the first imagery exercise, the participants will recall two past experiences that will be used during the imagery exercise. They will describe these experiences in detail when filling out the Imagery Exercise Worksheet (appendix J) for Session I. The first past experience will be a relaxation scene in which they felt very relaxed. The scene will be used to acquaint the participants with using imagery and initiate relaxation. The second scene will be a past performance in which they performed at their peak. This scene will be used to help the subjects to experience the emotions and sensations that come about during an optimal performance, such as feelings of confidence or the ability to focus.

Imagery Script

I. Selection of Imagery Exercises

In our imagery exercise together, two types of scenes will be used which are going to be individually chosen by you. You will choose a scene to cue off relaxation responses, and a performance scene involving a successful event. The relaxation scene must be a real circumstance: an activity, or an event, that is familiar to you; a real situation which was characterized by relaxation. For instance, you might recall a meadow during a backpacking trip in the fall. You might remember the specific time when you were sitting in the shade listening to a brook and gazing at the clouds.

Using your imagery exercise worksheets, describe the relaxation scene under roman numeral I at the top. This will enable you to examine it later to make sure that the details confirm the description to be that of a real experience, rather than an ideal one or a composite of several experiences. The experience should be very specific and concrete. Make sure that you include very specific details about every aspect of the event, including all of the details of the environment that affected your five senses. Describe the environment: the sights, smells, the weather, and your emotional state. In writing about the relaxation scene, note all elements of the scene. You should identify the location, time, activity, surroundings, and any and all sensory experiences that help make this scene realistic. Do not use any scenes which involve sleeping, being relaxed after strenuous exercise or tired, or relaxed sensations due to alcohol or drugs. Useful scenes involve activities such as quiet reading of a favorite story, lounging on the beach, or a peaceful stroll down a comfortable path. A recreational scene such as easy swimming around a lake may also be used.

A successful performance, drawn from real-life experience, will also be recalled. Write this down under roman numeral II. It may be one involving a personal best or a peak experience or a performance that was satisfying in some other way, such as where you felt especially focused or concentrated well, or particularly free and loose. This scene should also be described in detail.

II. Imagery Exercise

This exercise is used to further enhance the level of relaxation, and as a method for introducing visualization. Take a moment to note the rhythm of your breathing. Take two deep breaths on your own. Now let's take a deep breath together; I will count to five on the inhale, we will retain the breath for two counts, and then I will count to five on the exhale. Now take a moment to scan your body for any remaining muscular tension. "Switch on" the relaxation scene, as clearly as possible, so as to really be there again. Use all the sensory experiences to be in that circumstance again, noticing the sense of further relaxation. Please raise your hand to indicate when any part of this scene is clear. (Wait for thirty to forty-five seconds.)

Now switch off the scene and take a moment to assess whether there is any tension in any of your muscles. Focus awareness on each arm, your face, shoulders, chest, abdomen, legs, and feet, and relax them if necessary. Take a deep breath.

Now initiate the relaxation scene again. Hold your hand up again to signal when you are into the scene.

Now we will make the transition from the relaxation scene to your successful performance scene. Experience the visualization in a first-person way, not

as an observer watching a film. Feel yourself going through the motions of the performance, hearing the music, seeing the keyboard, and feeling relaxed and confident. Raise your hand when you are in the scene. (Wait thirty to forty-five seconds.)

Now switch off the scene and begin to relax your muscles, just as we did earlier, by taking a moment to assess whether there is any tension in any of your muscles. Focus awareness on each arm, your face, shoulders, chest, abdomen, legs, and feet, and relax them if necessary. Take a deep breath.

Now repeat the relaxation scene again. Raise your hand when you are into the scene. (Wait thirty to forty-five seconds.)

Now switch off the scene and begin to relax your muscles, just as we did earlier, by taking a moment to assess whether there is any tension in any of your muscles. Focus awareness on each arm, your face, shoulders, chest, abdomen, legs, and feet, and relax them if necessary. Take a deep breath.

When you feel completely relaxed, sit up so that I can hand you a questionnaire to fill out so that we can assess your progress. Remember, if you had trouble relaxing your muscles completely today, your own relaxation work during these next four weeks will help you to improve the level of relaxation that you can reach. The relaxation of all muscles is less important than the total level of overall relaxation. Scene control and clarity should also improve with later sessions.

Session Two

The imagery exercise in Session Two will involve six steps: the identification of a new performance scene, a relaxation exercise, the use of the relaxation scene, the use of a successful performance scene, the use of a new performance scene, and ending the session with the successful performance scene again. The session will begin by handing out the imagery exercise worksheets from the last session so that the subjects can re-acquaint themselves with their relaxation and successful performance scene.

Imagery Script:

Today we will begin by choosing a new performance scene. The performance scene will be chosen to match the goals that you chose at the beginning of the study. I am going to hand these goals back to you and I want you to choose one goal in particular that you will focus on today. You can decide to use imagery for technique enhancement, error analysis and correction, solidifying your memory, preparation for performance or competition, confidence enhancement, or another goal. The new scene that you select should be one which enables achieving this goal.

For instance, if technique enhancement is the intended outcome, then the new scene would involve one whereby the technique that you want to improve is emphasized. If there is a spot in your piece with parallel octaves that you want to play with loose arms, the scene will involve only this section of the piece, and you will imagine yourself playing with a feeling of complete looseness in your arms. If you want to improve your attack at the beginning of a piece, then imagine the

moment before starting the piece, preparing mentally, and then beginning with exactly the sound and motion that you are aiming for.

Scenes may involve a lengthy sequence of events or the repetition of a short sequence of activities. You might imagine only one measure, playing it with complete accuracy and technical ease, or you might want to check your memory of an entire passage.

Lie back, close your eyes, and direct attention to letting each muscle group become more relaxed… let the relaxation flow once again through each muscle and scan your body for any tension. Now take three deep breaths. Continue to relax your entire body. If there are any areas you want to further relax, take a few moments to do so. Use the deep breath also as a further way of increasing the level of your relaxation. Let's take one deep breath together; I will count to five on the inhale, we will retain the breath for two counts, and then I will count to six on the exhale. Now think about your relaxation scene. When you are fully involved in the scene, hold up your hand to signal that to me. Put all of your senses into the scene; see the small details around you, feel the ground at your feet, be aware of the temperature, hear the sounds—are there birds around? Can you hear the wind? Note your feelings during this experience; a state of calm, or a feeling of peace. If your mind wanders, gently bring yourself back to the scene. (Wait thirty to forty-five seconds.)

Now begin to transition into the successful performance scene that you used last time. Be more aware of bodily sensations associated with the successful performance, such as ease and fluidness, a sense of confidence in your skills, and what you think contributed the most to a successful performance. Repeat this scene

twice in your mind. When you have finished going through the scene twice, hold up your hand.

Review your muscle groups again to insure that you are still relaxed. Begin to go through the new performance scene again. (Wait thirty to forty-five seconds.) Be aware of the silence of your inner voices; no judging. You are merely watching yourself perform with a keen awareness of the music as it unfolds. Be aware of relaxed arms and hands. Be aware of the sound. You are not trying; there is a feeling of effortlessness. In a very slow, methodic way, maybe even in slow motion, picture yourself performing. Continue to relax, imagining a successful completion of your goal. Be aware of a feeling that you've done all the preparation and now you have a chance to share your music with others. Now repeat that scene one last time in your mind. Be aware of your relaxed body and your mind that is aware but not anxious. Notice the way the keyboard looks under your fingers; notice the lighting in the room; be aware of the presence of an audience. (Wait thirty to forty-five seconds.) Now wiggle your toes and fingers to bring yourself back to reality. Take a moment to stay in the centered state. When you feel ready, move to your side and gently raise yourself to a sitting position so that you can fill out your questionnaire.

Session Three

The same steps will be followed as in the above exercise, except for the initial relaxation. Instead of the muscle review being conducted by the researcher, the subjects will be told to initiate the relaxation on their own, using the method or methods that seemed to be most effective for achieving relaxation. They may choose

to use deep breathing, a relaxation scene, a focus on the release of tension in certain muscles, or a combination of those three activities. Subjects will signal the achievement of a comfortable level of relaxation by raising their hand.

The participants will repeat a relaxation scene twice, followed by the successful performance scene, the other performance scene to achieve performance goals, and finally the successful performance scene one last time.

Session Four

Subjects will not go through a guided imagery session during Session Four. Instead, ten minutes will be taken after the relaxation exercise and before the performance so that the subjects can briefly visualize two events: a successful end result followed by detailed mental practice of a specific part of their piece. This imagery routine will also be used the night before the performance and immediately prior to the performance. It will be their "pre-performance imagery routine." Using imagery as preparation for performance is seen as the final goal of imagery training, in which imagery practice is transferred to the *in vivo* environment.

The end result will involve playing the final part of their piece very well and then bowing for the audience. The subjects will also choose a specific part of the piece that they will practice in detail. They might have a part in mind that they want to play especially well or which often causes them difficulty. If it is a part that causes them difficulty, they are advised to imagine themselves feeling calm and confident as they begin that section, and stopping any negative thought patterns by listening intently to the music. If they do not have a specific part in mind, they should

mentally rehearse either the first phrase or section of the music. They are advised to keep in mind their final goals for performance, and mold the detailed mental rehearsal by envisioning themselves meeting these goals.

Imagery Script

You will now imagine the end result of your performance. Imagine that you are on stage in the recital hall, playing the last part of your piece. It has gone beautifully so far because you are "in the zone;" you have been concentrating, absorbed in the music, and every note has been played exactly as it was planned. You finish the piece beautifully; the whole audience has been absorbed in the music as well, and now you come out of your deep concentration to thunderous applause. Standing up to bow, you look into the audience and see that everyone is cheering your performance, and you know it has gone well. You feel happy, proud, and confident. Your performance spoke to the audience, and you felt a connection with them. Your playing could not have gone better.

Now take a moment to go through your own detailed mental rehearsal.

Session Five

Prior to the final performance in Session V, participants will follow the same procedures as used in Session IV in their imagery routine. They will use their "pre-performance imagery routine" in which they imagine the successful end result of the performance followed by detailed mental rehearsal.

APPENDIX J

IMAGERY EXERCISE WORKSHEETS

Session I

Name:_____

I. Name and describe your relaxation scene.

II. Name and describe your successful performance scene.

Imagery Questionnaire

1. On a scale of 1-10, how well did the relaxation proceed? _____
Did your muscles feel completely relaxed?

Did you have difficulty with a muscle group that remained tight?

2. On a scale of 1-10, how clear were the scenes? _____
Note every aspect of the scene, not just the visual aspect. Did you recollect all of the sensory aspects of the initial scene—smell, sound, touch, taste, emotional state?

3. On a scale of 1-10, how controlled were the scenes?_____
By "controlled," I am referring to how well you could manipulate the performance and relaxation scenes. Were you able to "hear" or "see" yourself playing exactly as you did in your ideal performance, or were there specific details that sounded or looked a certain way in your imagery that you could not change?

Were there any scenes that "drifted" or changed without your own conscious intent?

Session II

Name:_____

I. Name which one of your final goals you are going to focus on during this imagery exercise.

II. Name and describe your new performance scene, with specific information about the section of the piece and which aspects of the piece you will be attending to the most.

III. How is it related to the final goal? Describe in detail how the imagery exercise will impact your ability to reach that goal.

Imagery Questionnaire

1. On a scale of 1-10, how well did the relaxation proceed? _____
Did your muscles feel completely relaxed?

Did you have difficulty with a muscle group that remained tight?

2. On a scale of 1-10, how clear were the scenes? _____
Did you recollect all of the sensory aspects of the initial scene—smell, sound, touch, taste, emotional state?

3. On a scale of 1-10, how controlled were the scenes?_____
Were you able to "hear" or "see" yourself playing exactly as you did in your ideal performance, or were there specific details that sounded or looked a certain way in your imagery that you could not change?

Were there any scenes that "drifted" or changed without your own conscious intent?

Session III

Name:_____

Imagery Questionnaire

1. How did you initiate relaxation (check all that apply):
   i. Deep breathing ____
   ii. Relaxation scene ____
   iii. Focusing on relaxation of particular muscles ____

Describe any particular details about your initial relaxation.

On a scale of 1-10, how well did the relaxation proceed? _____
Did your muscles feel completely relaxed?

Did you have difficulty with a muscle group that remained tight?

2. On a scale of 1-10, how clear were the scenes? _____
Did you recollect all of the sensory aspects of the initial scene—smell, sound, touch, taste, emotional state?

3. On a scale of 1-10, how controlled were the scenes?_____
Were you able to "hear" or "see" yourself playing exactly as you did in your ideal performance, or were there specific details that sounded or looked a certain way in your imagery that you could not change?

Were there any scenes that "drifted" or changed without your own conscious intent?

Session IV

Name:_____

Imagery Questionnaire

1. Describe your pre-performance imagery routine. You will use this routine on the night before the performance and immediately prior to the actual performance.

Successful end result:

What went particularly well?

Detailed rehearsal:

What part of the piece do you want to rehearse in detail?

What about that section do you want to focus on?

What can you accomplish in your playing of that section which will help you to reach your final goals for performance?

Other comments:

1. On a scale of 1-10, how well did the relaxation proceed? _____
Did your muscles feel completely relaxed?

Did you have difficulty with a muscle group that remained tight?

2. On a scale of 1-10, how clear were the scenes? _____
Did you recollect all of the sensory aspects of the initial scene—smell, sound, touch, taste, emotional state?

3. On a scale of 1-10, how controlled were the scenes?_____
Were you able to "hear" or "see" yourself playing exactly as you did in your ideal performance, or were there specific details that sounded or looked a certain way in your imagery that you could not change?

Were there any scenes that "drifted" or changed without your own conscious intent?

Session V

Name:_____

Imagery Questionnaire

1. On a scale of 1-10, how well did the relaxation proceed? _____
Did your muscles feel completely relaxed?

Did you have difficulty with a muscle group that remained tight?

2. On a scale of 1-10, how clear were the scenes? _____
Note every aspect of the scene, not just the visual aspect. Did you recollect all of the sensory aspects of the initial scene—smell, sound, touch, taste, emotional state?

3. On a scale of 1-10, how controlled were the scenes?_____
By "controlled," I am referring to how well you could manipulate the performance and relaxation scenes. Were you able to "hear" or "see" yourself playing exactly as you did in your ideal performance, or were there specific details that sounded or looked a certain way in your imagery that you could not change?

Were there any scenes that "drifted" or changed without your own conscious intent?

APPENDIX K

PRACTICE LOGS

Name:_____

Week 1

Day One

Date:_____

Amount of time spent on progressive relaxation:_____

Circle one: Stage I, II, III

Did the progressive relaxation exercise affect your practice in any way?
Circle one: Y N

If so, describe how.

Did watching the videotape of your last performance affect your practice session today? Circle one: Y N
If so, how?

Mentally read over the score while hearing it in your mind. If this takes less than 20 minutes, listen to the piece more than once. Try to listen for different things each time.

Did this affect your:	Physical practice?	Y N
	Understanding of the piece?	Y N
	Ability to play the piece?	Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise or mental practice.

Week One

Day Two

Date:_____

Amount of time spent on progressive relaxation:_____

Circle one: Stage I, II, III

Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Read through the score while hearing it in your mind and tapping your fingers, using the correct fingering. If this takes less than 20 minutes, read through it more than once. Change the way you hear different spots in the piece each time; for example, change the phrasing or dynamic levels.

Did this affect your:	Physical practice?	Y N
	Understanding of the piece?	Y N
	Ability to play the piece?	Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise or mental practice.

Week One

Day Three

Date:_____

Amount of time spent on progressive relaxation:_____

Circle one: Stage I, II, III

Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Read through the score while hearing it in your mind and imagine how it feels to play it, using the correct fingering.

Did this affect your:	Physical practice?	Y N
	Understanding of the piece?	Y N
	Ability to play the piece?	Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise.

Rate your perception of the overall efficacy of using relaxation techniques and mental practice at this stage of the study on a scale of 1-10 (10 being very effective, 1 being not effective at all) _____

Week Two

Day One

Name_____

Try to come up with any new interpretive ideas during mental practice this week. They may be related, for example, to the shape and direction of each phrase, timing and use of rubato, dynamic changes, the relative tension and repose within harmonic progressions, character and mood changes, and changes in articulation, dynamics, and tone. Be sure to incorporate these into your physical practice.

Date:_____

Amount of time spent on progressive relaxation:_____
Circle one: Stage I, II, or III
Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Stage I Imagery: Rate your level of relaxation at the end of the session from 1-10, with 1 being extremely tense and 10 being extremely relaxed. _____

Stage I Imagery: Rate how vivid and realistic your relaxation scene was from 1-10, with 1 being not real at all and 10 being very real._____

Did watching the videotape of your last performance affect your practice session today? Circle one: Y N
If so, how?

Did you come up with any new interpretive ideas during mental practice? Circle one: Y N

If so, describe these ideas.

Mentally practice the piece without looking at the score, while imagining what the keys look like under your fingers.

Did this affect your:	Physical practice?	Y N
	Understanding of the piece?	Y N
	Ability to play the piece?	Y N

If so, describe how.
Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise or mental practice.

Week Two

Day Two

Date:_____

Amount of time spent on progressive relaxation:_____
Circle one: Stage I, II, III
Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Stage I Imagery: Rate your level of relaxation at the end of the session from 1-10, with 1 being extremely tense and 10 being extremely relaxed. _____

Stage I Imagery: Rate how vivid and realistic your relaxation scene was from 1-10, with 1 being not real at all and 10 being very real._____

Did you come up with any new interpretive ideas during mental practice?
Circle one: Y N
If so, name them.

Mentally visualize the score in your mind, hearing it as you go along. Be sure to do only one section at a time, and go back to the score if there is a section where every note is not clear.

Did this affect your:	Physical practice?	Y N
	Understanding of the piece?	Y N
	Ability to play the piece?	Y N

If so, describe how.

Were there any spots that were not clear all the way through? If so, name them.

How clear was the score, on a scale of 1-10?_____

-What spots were less clear than others? (name sections or measure numbers)

-What spots were the most clear?

Name any sections that you can hear at performance tempo but cannot play that fast yet.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise or mental practice.

Week Two

Day Three

Date:_____

Amount of time spent on progressive relaxation:_____
Circle one: Stage I, II, or III
Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Stage I Imagery: Rate your level of relaxation at the end of the session from 1-10, with 1 being extremely tense and 10 being extremely relaxed. _____

Stage I Imagery: Rate how vivid and realistic your relaxation scene was from 1-10, with 1 being not real at all and 10 being very real._____

Write down three specific spots with which you are having more difficulty. Name by section or measure numbers, and classify the problem as being primarily: musical/interpretive; technical (physical difficulties); or related to memory. Mark "other" and describe the problem if it does not fit into those three categories. Use physical practice in combination with mental practice on the three difficult areas. If the problem is technical, decide during physical practice what specific motions will help to play it perfectly. During mental practice, imagine going through those motions successfully.

1.
Circle one: musical/interpretive; technical; memory; other
Describe:

2.
Circle one: musical/interpretive; technical; memory; other
Describe:

3.
Circle one: musical/interpretive; technical; memory; other
Describe:

Describe how you mentally practiced those three spots.

Did this type of mental practice affect your:

Physical practice?
Y N

Understanding of the piece?
Y N

Ability to play the piece?
Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise or mental practice.

Rate your perception of the overall efficacy of using relaxation techniques and mental practice at this stage of the study on a scale of 1-10 (10 being very effective, 1 being not effective at all) _____

Week Three

Day One

Name:_____

This week, perform detailed mental practice in which you imagine playing individual sections, starting at the last section of the piece. Without looking at the score, but visualizing the score in your mind, start in the last section and play through it mentally; then start on the second-to-last section and play through to the end; and so on, until you have mentally played through the whole piece perfectly.

Date:_____

Did watching the videotape of your last performance affect your practice session today? (Answer on the day on which you watch the videotape).
Circle one: Y N
If so, how?

Amount of time spent on progressive relaxation:_____
Circle one: Stage I, II, or III
Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Stage II Imagery: Rate your level of relaxation at the end of the session from 1-10, with 1 being extremely tense and 10 being extremely relaxed. _____

Stage II Imagery: Rate your successful performance scene from 1-10, with 1 being not real at all and 10 being very real._____

Did this type of mental practice affect your: Physical practice?
Y N

Understanding of the piece?
Y N
Ability to play the piece?
Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise or mental practice.

Week Three

Day Two

Date:_____

Amount of time spent on progressive relaxation:_____
Circle one: Stage I, II, or III
Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how. You may write "same" if it was in the same way as the previous day.

Stage II Imagery: Rate your level of relaxation at the end of the session from 1-10, with 1 being extremely tense and 10 being extremely relaxed. _____

Stage II Imagery: Rate your successful performance scene from 1-10, with 1 being not real at all and 10 being very real._____

Did this type of mental practice affect your: Physical practice?
Y N

Understanding of the piece?
Y N
Ability to play the piece?
Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise or mental practice.

Week Three

Day Three

Date:_____

Amount of time spent on progressive relaxation:_____
Circle one: Stage I, II, or III
Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Stage II Imagery: Rate your level of relaxation at the end of the session from 1-10, with 1 being extremely tense and 10 being extremely relaxed. _____

Stage II Imagery: Rate your successful performance scene from 1-10, with 1 being not real at all and 10 being very real._____

Did this type of mental practice affect your: Physical practice?
Y N

Understanding of the piece?
Y N
Ability to play the piece?
Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise or mental practice.

Rate your perception of the overall efficacy of using relaxation techniques and mental practice at this stage of the study on a scale of 1-10 (10 being very effective, 1 being not effective at all) _____

Week Four

Day One

Go through your pre-performance imagery routine once this week, preferable the night before the performance. This routine should involve imagining the successful end result of the performance and a detailed mental rehearsal of one part of the piece.

Your mental practice this week will be designed by you. We have explored some different types of mental practice so that you can find out what is most effective for you and your piece. Structure your mental practice according to what you think will take you to your final goal(s).

Date:_____
Amount of time spent on progressive relaxation:_____
Circle one: Stage I, II, or III
Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Imagery Stage III: Choose which one of your three final goals you will be focusing on during this imaging exercise.

List it here: _____

List the visualization goal (choosing numbers 1-4 from the Individual Imagery Exercises and describing the details of the performance scene if necessary)

#____

Describe:

Is there now something happening in your imaging exercise that isn't happening during your current performances? Circle one: Y N
If so, what is it?

Did the imaging exercise affect your playing in any way? Y N
If so, describe how.

Describe the type of mental practice used.

Did this type of mental practice affect your:
Y N

Physical practice?

Understanding of the piece?
Y N

Ability to play the piece?
Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise, mental practice, or imagery.

Week Four

Day Two

Date:_____

Amount of time spent on progressive relaxation:_____
Circle one: Stage I, II or III
Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Did you notice anything from your imaging exercise that isn't happening during your current performances? Circle one: Y N
If so, what is it?

Did the imaging exercise affect your playing in any way? Y N
If so, describe how.

Describe the type of mental practice used.

Did this type of mental practice affect your:
Y N

Physical practice?

Understanding of the piece?
Y N
Ability to play the piece?
Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise, mental practice, or imagery.

Week Four

Day Three

Date:_____

Amount of time spent on progressive relaxation:_____
Circle one: Stage I, II, or III
Did the progressive relaxation exercise affect your practice in any way? Y N
If so, describe how.

Did you notice anything from your imaging exercise that isn't happening during your current performances? Circle one: Y N
If so, what is it?

Did the imaging exercise affect your playing in any way? Y N
If so, describe how.

Describe the type of mental practice used.

Did this type of mental practice affect your: Physical practice?
Y N

Understanding of the piece?
Y N
Ability to play the piece?
Y N

If so, describe how.

Please list any questions, comments, or specific difficulties which you are having with the progressive relaxation exercise, mental practice, or imagery.

Rate your perception of the overall efficacy of using relaxation techniques and mental practice at this stage of the study on a scale of 1-10 (10 being very effective, 1 being not effective at all) _____

APPENDIX L

RELAXATION EXERCISES FOR INDIVIDUAL PRACTICE

Modified from *Seven Steps to Peak Performance* (Suinn 1986)

Progressive Relaxation Stage I

1. Begin with your dominant hand. Clench it into a fist, notice the tension (5-8 seconds), release, and notice the contrasting relaxation. REPEAT.

2. Tense the other hand into a fist, then relax. REPEAT.

3. Flex the right arm to tighten the biceps, then relax. REPEAT.

4. Flex the other arm, then relax. REPEAT.

5. Frown to tense the forehead, then relax. REPEAT.

6. Clench your jaws tight, then relax. REPEAT.

7. Shrug the shoulders for tension, then relax. REPEAT.

8. Tighten the stomach muscles, relax. REPEAT.

9. Point your toes downward to tense, relax. REPEAT.

10. Take a slow deep breath, drawing in the air by your stomach moving outward; slowly exhale by your stomach moving inward.

11. Repeat taking the deep breath a total of five times. Center your attention on this breathing process. On the inhale and exhale for the first three breaths, count to five. On the last two breaths, count to six on the inhale, three while holding the breath, and count to eight on the exhale.

Whenever you wish to further control your relaxation, return to "centering":
1. Center your attention on breathing with the stomach to cause relaxation, then
2. Scan your muscles to determine if any important tension remains in spots, then use the centered breathing to flow the relaxation to those spots.
3. Now as you continue the centered breathing, visualize each muscle group loosening up one at a time (like light bulbs being turned off one by one).

Progressive Relaxation Stage II

"Relaxing on Cue"

Using centering:

1. Focus your attention on centered breathing, using five deep breath cycles. Count to five on each inhale and seven on each exhale, holding the breath for three counts in between the inhale and exhale. Think of the word "relax" on the exhale.

2. Flow the relaxation through each muscle group—first the dominant hand, then the opposite hand, one bicep and arm, the other bicep and arm, the forehead, jaw, shoulders, chest, stomach, thighs and legs, and feet.

3. As a final check, continue centered breathing, visualizing each muscle group loosening up (like light bulbs being turned off one by one).

Include some triggering cues as you breathe and relax. Experiment to find what works best. For example, as you breathe and relax think "I'm loose and relaxed" several times as your cue. Or picture the words "loose and calm." Or picture a color that feels relaxing to you. When you discover the cue that seems right, use that along with the centering by thinking of your cue word (or color), along with your breathing.

Progressive Relaxation Stage III

After 3-4 practice sessions with Stage II, you should be able to use centering to achieve relaxation within less and less time, reducing the duration from 20 to 30 minutes to 5 to 10 minutes. In Stage III you should be able to initiate relaxation by centering and in places other than a quiet room and without lying down or closing your eyes. Later, you should be able to achieve relaxation as quickly as less than one minute.

First, center your breathing with the stomach breathing method.

Next, visualize each muscle group loosening up (like light bulbs being turned off one by one).

Next, use your triggering cues to relax further.

Now, check for any spots that are still tense.

Continue centered breathing to flow relaxation in those spots.

In addition to using progressive relaxation prior to physical practice at the piano, take some time one day this week to pick a situation in which you feel relaxation will be useful. This might be waiting in line at the grocery store or waiting for a piano lesson. You may center while standing or sitting. Initially, you may want to close your eyes for the brief centering exercise; later you may be able to center with your eyes open but not focused on anything specific.

Training Log for Relaxation Exercises

Use numbers from -10 to +10, with -10 meaning extremely tense and +10 meaning extremely relaxed, to describe your level of relaxation both before and after the relaxation exercise.

Stage I

When your level after relaxation has consistently reached +7 or better, then move to Stage II instructions. This usually takes 3-4 practice sessions.

Date of practice	Level before relaxing	Level after relaxing
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Stage II

When your level after relaxation has consistently reached +7 or better, then move to Stage III instructions. This usually takes 3-4 practice sessions.

Date of practice	Level before relaxing	Level after relaxing
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Stage III

Date of practice	Level before relaxing	Level after relaxing
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

APPENDIX M

IMAGERY EXERCISES FOR INDIVIDUAL PRACTICE

Modified from *Seven Steps to Peak Performance* (Suinn, 1986)

Week 2

Imagery Rehearsal: Stage I

1. After going through five deep breaths and your progressive relaxation exercise to achieve a relaxed and centered state, sit or lie down comfortably.

2. Now switch on the relaxation scene that you chose during Session I. Let this scene develop, allowing yourself to be there and using any senses that make the experience real for you. Don't try to force the scene; as any details appear, use these details to help the rest of the scene.

3. As you experience this relaxing scene, use it to further increase your relaxation. Allow your senses to enable you to be aware of being in the scene, such that you are truly there. Retain the scene for 30 seconds or so.

4. Now switch off the scene.

5. Return to centering: breathe deeply, flow relaxation through each muscle group, and scan your muscles for tension.

6. Switch on the scene again. Retain it, and be there in the scene for about 30 seconds. Then off. Then return to centering once again.

7. Repeat.

8. End the session by first moving your fingers and feet forward and backward, then opening your eyes.

Week 3

Imagery Rehearsal: Stage II

After your three repeat sessions of Stage 1, you should now be good at centering and visualizing the relaxation scene. In all scenes, always be there as a participant (inside your body) and not an observer (outside your body). Pick a quiet place and time. Sit or lie down comfortably.

1. After going through five deep breaths and your progressive relaxation exercise, switch on your relaxation scene, and let it come realistically. Be in it for about 30 seconds.

2. Switch off the relaxation scene.

3. Use centering: breathe deeply, flow relaxation through each muscle group, and scan your muscles for tension.

4. Now switch on your successful performance scene—a specific event in which your body functioned at a peak performance level. Let the scene be real and vivid, and be there again. Be in it long enough to experience the main parts of the event (through the finish line, or until the point was finished).

5. Switch off the scene and center again.

6. Switch on the success scene again, experience the competition, especially how well you are functioning.

7. Switch off the scene, center, and then end the session.

Week 4

Stage III

Now that you have been practicing imagery rehearsal for three weeks, you may now begin to apply it to different goals. Decide which goal it should help you to achieve as you prepare for the next performance (keep in mind the list of three final goals that you devised at the beginning of the study). Once you select your goal, then use the appropriate procedure described below pertaining to that goal. Using this procedure, use imagery rehearsal three times this week.
Remember to go through your pre-performance imagery rehearsal once this week, preferably on the night before the final performance, before you go to bed. The pre-performance imagery routine consists of the following two steps: imagining the successful end result of the performance followed by a detailed mental rehearsal of one part of the piece.

Choose one of the following procedures that will most closely align with your final goal:

I. To be able to develop control over a "**winning feeling**" to give you more self-confidence.

II. To **remove tension** if there is part of your body that often gets tense or a moment during the piece when you normally get tense while performing.

III. To practice a **part of your piece,** especially for accuracy, musicality, solid memory, or character (such as an aggressive beginning or a dramatic ending). What part of your technique you practice may have been something you want to change from watching the videotape of your performance.

IV. To practice **key phrases (cues),** the *trigger phrases* or *attitudes* that help you achieve peak performance.
This can help with the following goals: avoiding judgmental "inner voices" that come up during performance, developing concentration or focus, enhancing musicality or character, and confidence.

For instance, instead of a specific movement, you might visualize:

a. Performing, repeating your key phrase or imagery, such as "remember, smooth and easy" or "explosive, like a bullet."

b. Performing, emphasizing an attitude such as "aggressive" or "go all out."

Procedures for Each Goal

I. To be able to develop control over the "**winning feeling**" to give you more self-confidence.

Procedure: *Identify a prior competition or performance where you had that winning feeling (the "winning feeling" scene). Decide on a word or phrase that best triggers this feeling.*

1. Center (breathe deeply, flow relaxation into each muscle, and scan the body for tension).
2. Switch on your relaxation scene for about 30 seconds.
3. Switch off the relaxation scene.
4. Center.
5. Switch on the successful performance scene that you used in the first session.
6. Switch off the scene and center.
7. Switch on the winning-feeling scene for about 30 seconds.
8. While in this scene, experience the winning feeling.
9. While in this scene, also mentally repeat the word or phrase you decided best triggers this feeling.
10. Switch off this winning-feeling scene and center.
11. Repeat the winning-feeling scene two more times, centering each time after you switch it off.
12. Now switch on a scene where you are in the recital hall where the next performance will take place. Visualize yourself sitting in the audience before the recital begins. While you are waiting to begin your piece, visualize yourself using your winning-feeling word or phrase to trigger the winning feeling.
13. Switch off this scene and center.
14. Repeat this scene two more times.
15. Switch on your successful performance scene, experiencing the feelings of success associated with this scene.
16. End the session with centering.

Center before and after each scene.
Relaxation Scene
Successful Performance Scene
Winning Feeling Scene (three times)
Pre-performance scene, repeating word or phrase (three times)
Successful Performance Scene

II. Goal: To **remove tension** if there is a part of your body that often gets tense or a moment during your piece when you always get too tense.

Procedure: *Visualize scene three times without tension, then go through the successful performance scene.*

1. Center (breathe deeply, flow relaxation into each muscle, and scan the body for tension). Then visualize yourself in performance just before that moment when you normally become tense.
2. While you are experiencing the scene, focus on the experience of relaxation you had acquired through the centering.
3. If you discover that you are starting to feel tension building, end the scene and return to centering.
4. When the centering exercise has led to your being relaxed again, switch on the scene.
5. When you are capable of visualizing the scene without tension, this signifies that you have now learned to eliminate the tension.
6. Repeat visualizing the scene without tension two more times.
7. Switch on your successful performance scene that you used during the first session, experiencing the feeling of success.
8. End the session with centering.

III. Goal: To practice a **part of your piece**, especially for accuracy, musicality, solid memory, or character (such as an aggressive beginning or a dramatic ending).

Procedure: *Pick a practice scene during which it is easy for you to perform the above actions or movements (for example, if you are alone in the practice room or playing for a close friend.*

1. Center (breathe deeply, flow relaxation into each muscle, and scan the body for tension).
2. Switch on the practice scene, visualizing yourself performing this specific set of movements or actions with an ideal sound and technique.
3. Notice the way in which your body moves and the general "feel" as you perform the movements or actions.
4. Switch off the scene and center.
5. Repeat this scene for a total of two more times. Be certain that your rehearsal involves correctly performing the desired movements. Remember that you are programming your body, and hence you want to program correct and not incorrect movements.
6. Switch on the successful performance scene that you chose during Session I, experiencing the feelings of success.
7. End the session with centering.

IV. Goal: To practice your key phrases (cues), or the trigger phrases or attitudes that enable you to perform at your peak. This can help with the following goals: avoiding judgmental "inner voices" that come up during performance, developing concentration or focus, enhancing musicality or character, and confidence.
For instance, instead of a specific movement, you might visualize:

i. Performing, repeating your key phrase or image, such as "remember, smooth and easy" or "explosive, like a bullet."
ii. Performing, emphasizing an attitude such as "aggressive" or "go all out."

Procedure: *Identify your key (trigger) phrases or attitudes that you feel will help your performance.*

1. Center (breathe deeply, flow relaxation into each muscle, and scan the body for tension).
2. Switch on a performance scene for practicing the key phrases or attitude.
3. Rehearse your key phrase or the attitude.
4. Switch off the scene and center.
5. Repeat the scene twice. Pay attention to how the use of your key phrases or the attitude helps your performance.
6. Switch on the success competition scene, experiencing the success feelings.
7. End the session with centering.

APPENDIX N

FINAL EVALUATION

Name:_____

1. Did you feel more anxious or less anxious than you did in your first performance at Session I?

Circle one: more anxious less anxious the same

If you circled more or less anxious, do you believe that the change in anxiety level was due to (circle as many as you believe are applicable; do not circle anything if you do not believe that any of the following influenced your anxiety level):

a. Mental practice
b. Imagery
c. Relaxation training
d. Watching videotapes of performances
e. Performing each week in the sessions
f. Other (if other, write in):_____

2. Did you feel more confident or less confident than you did in your first performance at Session I?

Circle one: more confident less confident the same

If you circled more or less confident, do you believe that the change in confidence level was due to (circle as many as you believe are applicable):

a. Mental practice
b. Imagery
c. Relaxation training
d. Watching videotapes of performances
e. Performing each week in the sessions
f. Other (if other, write in):_____

3. Did you feel more prepared or less prepared than you did in your first performance at Session I?

Circle one: more prepared less prepared the same
If you circled more or less prepared, do you believe that the change in feeling prepared was due to (circle as many as you believe are applicable):

a. Mental practice
b. Imagery
c. Relaxation training
d. Watching videotapes of performances
e. Performing each week in the sessions
f. Other (write in):_____

4. Did you feel that your memory was more or less stable than it was in your first performance at Session I?

Circle one: more stable less stable the same

If you circled more or less stable, do you believe that the change in stability of memory was due to (circle as many as you believe are applicable):

a. Mental practice
b. Imagery
c. Relaxation training
d. Watching videotapes of performances
e. Performing each week in the sessions
f. Other (write in):_____

5. Did you feel that your concentration level was higher or lower than it was in your first performance at Session I?

Circle one: higher lower the same

If you circled higher or lower, do you believe that the change in concentration level was due to (circle as many as you believe are applicable):

a. Mental practice
b. Imagery
c. Relaxation training
d. Watching videotapes of performances
e. Performing each week in the sessions
f. Other (write in):_____

6. Which of the following factors influenced your final performance the most? Circle one.

a. Relaxation techniques
b. Mental practice
c. Imagery
d. None

7. Which area was influenced the most by your use of relaxation techniques, mental practice, and imagery? Circle one.

a. Memory
b. Concentration
c. Anxiety
d. Self-confidence
e. Other (write in):_____
f. None

8. Looking over the goals that you chose at the beginning of the study, which ones were met? Write down each goal that was met. If no goals were met, do not fill in any spaces.

1.

2.

3.

9. Rate the overall effectiveness of all aspects of the relaxation training, imagery, and mental practice techniques in enhancing your performance ability. Use numbers from 1-10, with "1" meaning not effective at all, and "10" very being effective.

_____