THE EFFECTS OF A COMBINED PROGRESSIVE MUSCLE RELAXATION,
CUE-CONTROLLED RELAXATION, AND IMAGERY PROGRAM ON THE
PERFORMANCE OF COLLEGE BASEBALL BATTERS AND PITCHERS

A Thesis

Presented in Partial Fulfillment of the Requirements
for the Degree Master of Arts

by

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1984

Approved by

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ACKNOWLEDGMENTS

The author would like to thank Dr. Richard K. Russell for his generous contributions of advise, encouragement, and training in the administration of the techniques. The thoughtful counsel of Committee Members Dr. W. Bruce Walsh and Dr. Pamela S. Highlen is also greatly appreciated. Furthermore, this research would not have been possible without the effort and support of the players on the 1984 Ohio State University Baseball Team and their coaches, Dick Finn and Joe Carbone. Finally, the author would like to express sincere gratitude to his spouse, Patricia M. Paterson, for all of her support and understanding.
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INTRODUCTION

Sport psychology is a relatively new yet increasingly popular field of study in the United States, although Europeans have been investigating this topic for a number of years (Singer, 1982). "(It) is now beginning to surge" (Browne and Mahoney, 1984, p. 620) in the U.S. after a rather slow beginning.

Athletic competition serves as a source of entertainment for many people who either watch or participate in sports, and a number of people rely upon it as their means of livelihood. Sport is clearly an important part of our society, and has an impact on the lives of many. Hence, it seems reasonable that individuals have been increasingly interested in applying the principles of psychology to athletic competition in an attempt to improve performance.

Much of the sport psychology research has involved the application of theory-based techniques (which have typically been employed by counseling psychologists with their clients) to athletes in an attempt to help them improve their performance. The current study continues this trend, yet is unlike most previous investigations
which have not focused on team sports. Since the bulk of athletes participate in team sports, it seems worthwhile to see if these techniques have effects similar to those observed with athletes participating in individualized sports. Of course, individual performance within the team context remains the focus. Baseball seems a most appropriate choice of study in that it is a team sport in which an individual's success is largely dependent upon his or her own performance as opposed to the performance of teammates.

In this investigation, players on the Ohio State University Baseball Team participated in a 10-week program in which they were trained in Progressive Muscle Relaxation (hereafter referred to as PMR), Cue-Controlled Relaxation (hereafter CCR), and imagery. It was hypothesized that learning this combination of skills could help the players improve their batting or pitching performance. It also was expected that the overall performance of the team would improve. Should performance be enhanced by the program, support would be derived for the usefulness of the application of these techniques to the team sport of baseball.

In the remainder of this introduction, the PMR (and CCR) procedures will be presented and examined along with a review of the relevant literature, followed by a discussion and examination of and accompanying literature review for
imagery. Finally, the design and hypotheses will be presented.

**Progressive Muscle Relaxation**

**Historical Development and Description of PMR**

When examining treatment techniques in the psychological literature, it is common to find a wide variety of differences in administration. As a result, it is then difficult to validate the procedure by examining the studies, because many of the studies use differing procedures. Fortunately, the administration of PMR seems to be fairly consistent across the literature, although frequently there are activities appended to the relaxation. This consistency may be the result of an evolution in which researchers use a current model, which is an improved modification of the older model.

Bernstein and Borkovec (1973) outline the evolution of PMR treatment strategies. Few would fail to recognize Edmund Jacobson as the founder of progressive relaxation (even the name has evolved to progressive muscle relaxation) in the 1930's. Bernstein and Borkovec credit Joseph Wolpe for modifying Jacobson's procedure to make it more efficient. Ironically, the authors themselves are probably the latest link in the definition and standardization of the technique. In any case, it seems that for the most part researchers are patterning their administration of relaxation after the work of these
individuals.

Jacobson, in his 1938 landmark book *Progressive Relaxation*, outlines the steps involved in the procedures and applications of PMR. It is important to keep in mind while reading the book that it was written for physicians, by a physician. His relaxation is much more extensive than the PMR practiced today in that he advocates one half to one full hour in therapy three to seven times a week and one to two hours of homework practice each day, adding that nonclinical cases (possibly athletes) would require much less time. He says the physician is essentially training the patient in the "...negative of doing..." (p. 64). That is, tensing in order to relax. While the "patient" lies on his/her back on a chair or bed with arms at the side and the legs not crossed, the physician instructs the patient to tense and relax an extensive list of muscles, one group at a time. One important difference between today's PMR and that of Jacobson is that the latter concentrates on one muscle group (more if the session is going well) each day.

The patient is taught to recognize contraction in the muscles and works at "the cultivation of the muscle-sense" (Jacobson, 1938, p. 43), while learning to distinguish tenseness from strain. The physician may apply physical resistance to the muscles as they are being tensed, and tell the patient that "This is you doing!" (p. 49) so that the patient learns what not to do. The main duty is to
watch the patient carefully and prevent the person "...from doing the wrong thing" (p. 64), and "If he fails, he may be scolded and made to try again..." (p. 52).

Jacobson mentions the use of sedatives, suggestion, and imagery (to enable the patient to note particular tension during particular activities) as additions to the relaxation. He says that athletes, singers, and dancers could learn very quickly because of their prior familiarity with muscular relaxation and tension. "Willingness is the cardinal requirement..." (Jacobson, 1938, p. 413).

The current model (Bernstein and Borkovec, 1973) attempts to provide the client who is experiencing tension with a technique to eliminate or reduce it. In a quiet, attractive, dimly-lit room, the client is to sit in a comfortable chair (or couch). The client should wear comfortable clothing and remove glasses, shoes, rings, etc. so that the individual is as at ease as possible.

During the first session the counselor presents the rationale and then has the client tense and relax 16 different muscle groups, one at a time and in order (arms to feet) as indicated in Appendix A. The client is told how to tense the muscles before the tensing period begins. The tension period generally lasts 5 to 7 seconds, and during that time the counselor focuses the client's attention on the feelings of tension with statements such as "feel the muscles pull." The counselor's voice during
tension should be louder, faster, and more intent. The client is then instructed to "relax" for 30 to 40 seconds during which time the counselor engages in softer, more calm "relaxation patter" (statements such as "enjoying the feelings of relaxation").

Each muscle group is tensed and subsequently relaxed twice before moving to the next group. After all groups have been tensed, the counselor counts backwards from four, with each number bringing movement back into a different group of muscles. The client should practice the PMR procedure twice each day on his/her own.

Bernstein and Borkovec (1973) also suggest that the client be instructed to raise the little finger on the hand closest to the therapist when the present muscle group is completely relaxed (comparing it to another group). They suggest that the client's attention be directed to his/her breathing during work on the chest, shoulders, and upper back. Feet should be tensed for less time than other groups (five seconds) to avoid cramps. Over the entire session, the therapist's voice should decrease in volume and speed and move from a conversational tone to a more smooth and quiet one. Direct suggestions and prescriptive statements are avoided because they are considered to be hypnotic and might not coincide with what the client is feeling.

Variations of Bernstein and Borkovec's procedures are
also presented in their manual. Often, muscles groups are combined and the total number of groups is reduced to seven in the fourth session, and further reductions bring the total down to four (arms, neck and face; torso, and legs) during the sixth session. Recall relaxation is often instituted during the eighth session by having the client concentrate on the tension in each of the four muscle groups and then recall the feelings of relaxation (i.e. same as before but with no physical tension). Clients often report deeper relaxation after recall relaxation. Counting is often introduced in the ninth session and then used exclusively in the last session. In counting, the client relaxes the various muscle groups as the counselor counts from 1 to 10 (interspersing statements on which groups to relax). Bernstein and Borkovec also discuss differential relaxation, where the goal is to learn to have the minimal amount of tension in the muscles which perform a particular activity, and no tension in nonessential muscles. Clearly, as the client or athlete becomes more skilled, less time and effort should be required to achieve relaxation.

Indications of successful relaxation in the client (as discussed by Bernstein and Borkovec) include "slack jaw," slower breathing, feet 45 degrees away from each other, and less movement as the session progresses.
PMR variations. Nideffer (1981) defines progressive relaxation as "any procedure that involves a regular, systematic relaxation of muscle groups" (p. 173), which is consistent with the previously mentioned procedures. He goes on to say that there is little difference between some forms of hypnosis and progressive relaxation. Reading of his counselor statements would lead one to believe this is the case for his form of relaxation (e.g. "...you will find yourself drifting...," p. 177). Nideffer also goes against the norm in recommending that the athlete not employ tension to bring on relaxation, pointing out that some Eastern European athletes actually use the tensing to "psych" themselves up. Most practitioners, however, see tensing as a means of "swinging the pendulum" in the wrong direction so that it swings back even farther in the right direction (relaxation). Nideffer employs counting, but his range is from 1 to 20. He takes 5 to 15 minutes in the session to have athletes achieve relaxation and typically begins imagery as a follow-up to relaxation. This amount of time is characteristic of post-Jacobsonian PMR, with the possible exception of the first few sessions.

Cue-Controlled Relaxation (CCR) is more accurately viewed as a supplement to rather than a variation of the standard relaxation procedures. Russell, Wise, and Stratoudakis (1976) describe CCR as the pairing of the relaxed state and a cue word such as "calm." After going
through the relaxation procedures described by Bernstein and Borkovec (1973) the athlete/client attends to breathing while subvocally repeating the cue word during 15 to 20 consecutive exhalations. After refocusing on the relaxation for a minute, the individual repeats the procedure (20 more pairings of the relaxation and cue word). After approximately six weeks of consistent practice, the cue word should elicit relaxation if employed during periods of tension. Essentially, CCR is a classical conditioning paradigm in which the cue word (conditioned stimulus) comes to elicit the same response as relaxation — e.g., lack of tension. The advantage of the cue word is that it can facilitate relaxation in a quick and efficient manner in a variety of situations. (The same is true for recall relaxation but to a lesser extent.) The benefit of developing this skill seems obvious to the pitcher who needs to deliver another pitch quickly, or to the batter who has just seconds until the next pitch.

Another supplement to (really a "facilitator" for) PMR is (EMG) biofeedback. This allows the athlete/client to receive information on the amount of electrical activity in the particular muscles. Thus, the individual has an external indicator of how relaxed he/she is, and might better learn how to become/stay relaxed. EMG equipment is often connected to the frontalis (forehead) muscle.

It is typical for PMR to be used as a prerequisite for
(and in combination with) other treatment techniques. In systematic desensitization, for example, an individual with an intense fear would learn relaxation skills before encountering the feared object/situation in vivo or in imagery. Perhaps the most popular combination in sport is PMR followed by imagery. Imagery in this context usually involves the detailed visualization of successful performance from an internal perspective. Visuo-Motor Behavior Rehearsal (VMBR), developed by Suinn (1972) is one name for the union of the two techniques, and considerable research has followed Suinn's initial study. Many believe that relaxation deepens the quality of imagery or provides a "relaxed concentration" (Weinberg, Seabourne, & Jackson, 1981, p. 236) for imagery. Occasionally appended to PMR or PMR plus imagery is a cognitive training strategy such as Ellis' R.E.T. (Dewitt, 1980), Meichenbaum's Stress Inoculation Training (Zeigler, Klinzing, & Williamson, 1982), or thought stopping (Meyers & Schleser, 1980).

Possible Explanations for Beneficial Effects of PMR with Athletes

What causes anxiety for the athlete? Fisher and Zwart (1982) found outcome uncertainty, outcome certainty (negative direction), ego threat, and anticipation to be anxiety factors/responses among 40 male collegiate basketball players. Perceived success and ability and competitive trait anxiety accounted for 47% of the anxiety
response variance. Researchers have attempted to measure the concept of anxiety in a variety of ways. The discussion of the research will reveal the various self-report measures (some transparent and a few more camouflaged) and physiological measures (e.g. heart rate or oxygen consumption).

The Yerkes-Dodson Law states that performance is best when arousal is moderate, and falls off when arousal is either too high or too low (the inverted-U shaped curve). This "law" has frequently been applied to the competitive athletic situation. That is, it is believed that an athlete experiencing a moderate amount of arousal during competition will perform at his/her best. Some anxiety before competition is normal and useful (Singer, 1982). Oxendine (1970) states that a slightly-above-average amount of anxiety for all motor tasks is preferred.

The inverted-U shaped curve has been validated by the research. For example, Powell and Verner (1982) studied 20 undergraduates learning how to parachute. They found that high levels of anxiety (as indicated by heart rate, the Spielberger State-Trait Anxiety Inventory, and fear ratings by an experienced jumpmaster) were associated with poor performance. It was unlikely that any of their novice participants experienced less than an optimal amount of anxiety. Sonstroem and Bernardo (1982) selected five female college basketball players from each of six teams
participating in a tournament. They found that moderate levels of state and trait anxiety were associated with high overall performance and points scored. A quadratic relationship (supporting the inverted-U) was found between these two performance measures and state anxiety with performance diminishing with low and especially high levels of state anxiety (regardless of trait anxiety). They also found that trait anxiety was a strong predictor of state anxiety, and that athletes with moderate trait anxiety were least affected by state anxiety variations.

If anxiety is a problem for the athlete, the sport psychologist should determine that it is not resulting from inadequate preparation (i.e. reactive anxiety; Sweeney & Moran, 1982). More often than not, however, the athlete will have adequate preparation (although coaches may need to consult with the athlete on particular skills), and will have too much rather than too little anxiety during competition. Unfortunately, few athletes are trained in recognizing and controlling signs of stress (physical and psychological) that influence performance (Zeigler, et al., 1982). PMR may serve to provide the needed recognition and controlling skills. Ideally, athletes experiencing too much anxiety can realize it and employ the PMR technique to bring them back to a moderate level. They can be taught to control their state anxiety, which is especially critical if they are typically anxious (high trait). One reason why
PMR might be effective is that by practicing relaxation, the athlete has created a response incompatible with the anxiety she/he is feeling, thereby lowering state anxiety.

PMR's effectiveness could also be explained in terms of state-dependent learning. That is, it is best to perform under the same conditions that one practices. One way to do that if competition is anxiety-provoking would be to build anxiety into practice. This an alternative proposed by Singer (1982). But too much anxiety can impede performance, and therefore reducing anxiety during competition with PMR should best facilitate the demonstration of those "practice-perfect" skills. Millman (1981) argues for the use of the same "mental set" in practice and competition.

Berstein and Borkovec (1973) propose that PMR may be a positive distraction. Titley (1976) says that visuo-motor behavior rehearsal helps to desensitize athletes to distracting cues like the crowd. These views would be supported by Nideffer (1981). Nideffer states that as an athlete's arousal level goes up, the athlete will play to his/her attentional strength, be less able to shift to other types of attention, and will become more internal and narrow in attentional focus. Nideffer creates four types of attention out of his two dimensions (narrow versus broad and external versus internal): (a) broad-external, (b) broad-internal, (c) narrow-external, and (d)
narrow-internal. Different athletic skills require different attentional foci (e.g. golf requires narrow-external; effective coaching requires broad-internal; and basketball passes demand broad external). In baseball, the batter and pitcher need a narrow external focus at the time of the pitch, but possibly a broader focus at other times. A narrow-internal focus, which the anxious athlete will probably move toward, is associated with "choking." PMR minimizes anxiety (preventing the narrow-internal choking) and external and internal distractions, and improves concentration ability. Nideffer also suggests that PMR is especially useful for the athlete needing structure and control, and says that the procedure has much face validity.

Mediating Variables in PMR

Trait and state anxiety. The constructs of trait and state anxiety have already been mentioned, and it appears as if PMR might be most useful for individuals with high trait anxiety. It might even reduce trait anxiety somewhat, over a long period of time (Sweeney & Horan 1982). PMR can be useful regardless of trait anxiety level, to bring the athlete's state anxiety back to a moderate level (from a higher level). If the athlete is already at a moderate level he/she would probably impede performance by applying the technique. It is also important to note that what is a moderate level of anxiety
for one athlete may not be moderate to another, and therefore one must look at the amount of anxiety relative to the individual.

**Ability level.** Is PMR effective for the athlete regardless of ability level? Sweeney and Horan (1982) believe the skill should already be adequately prepared. While imagery appears to be effective with both high and low-ability athletes, the literature favors the more skilled athlete (a discussion of imagery occurs later). Noel (1980) examined low versus high-ability tennis players given the VMBR (PMR and imagery) treatment. He discovered that while high-ability players significantly improved on first service accuracy and self-report of serving control, low-ability players became significantly worse on both measures. He concluded that high-ability players could improve from VMBR, while low-ability players might improve performance by being on the court practicing. In general, it seems as if PMR can be most effective in helping high-ability athletes relax in order to maximize the performance of certain skills, while low-ability athletes may be helped to overcome anxiety associated with learning the skill.

**The task(s).** Another mediating variable is the type of task/skill to be performed in sport. Oxendine (1970) postulates that high levels of arousal impair performance of complex skills involving fine muscle movements,
coordination, steadiness, and general concentration (e.g. gymnastics). If the task is one of strength, endurance, and/or speed (e.g. weight lifting), Oxendine would then suggest a high level of arousal for best performance. He says, for example, that baseball pitchers, baseball batters, and divers need "level two" anxiety for best performance on a scale of zero (normal state) to five (extremely excited). Clearly, though, one cannot always say an entire sport is best served by one arousal level. Many sports can be put into both of Oxendine's categories, depending on the task being performed. For example, a tight end in football might call upon his strength to break through the line of scrimmage, but then needs concentration and steadiness to catch the pass. He must ideally be able to shift from one level of arousal to another. Other sports require less or no shifting, but the sport psychologist and the athlete must be aware of the demands of the particular sport in applying PMR. The baseball pitcher or batter needs a high level of coordination, steadiness, and concentration when he/she begins to perform a task, and then may need a short burst of strength or speed.

Oxendine's speculations on anxiety level and type of task are generally supported by the available research. Powell and Verner (1982) in their work with parachutists, found that performance on different parts of the jump was
facilitated by particular levels of anxiety. Owen and Lanning (1982) studied 162 high school athletes who were one standard deviation above the mean on the State-Trait Anxiety Inventory and Nideffer's Test of Attentional and Interpersonal Style (OIT, OET, and RED scales only), indicating the presence of state anxiety and inappropriate attentional focus. They found that performance on the Porteus Maze Test improved and state anxiety decreased for subjects in the relaxation training, attentional training, and "both treatments" groups. Thus, they concluded that relaxation and attentional training were effective methods for improving performance where fine motor control is involved.

Sonstroem and Bernardo (1982) found support for the U-shaped curve for basketball, which requires gross and fine muscle movements in combination. They believe it would be improper to apply the curve to endurance and strength tasks. Griffiths, Steel, Vaccaro, and Karpman's (1981) investigation of scuba divers involved a complex performance task, and they found significant negative correlations between performance and anxiety. Finally, Nideffer and Deckner (1970) taught the PMR procedure to a shot putter (i.e. a strength task) who was rather small for his sport and who the coaches believed had "...reached the limits of his physical potential" (p. 821). The athlete had for a long time been unable to beat his own conference
record. He was seen only once and was instructed to practice the relaxation twice each day and before competition. Shortly afterward, he beat his own conference record twice. Like the many other case studies with PMR, these results need to be interpreted cautiously, but the findings are intriguing. These results conflict with Oxendine and others' beliefs, but perhaps an increased concentration on the task (provided by the PMR) or other nonspecific factors outweighed the decreased arousal. It is also possible that the shot putter's arousal was higher than the "optimal high" for strength tasks.

The situation. The situation in which the athletic performance occurs is another factor which must be considered. Lane (1980) concludes that "it is under the most extreme conditions of competition...that the advantages of VMBR training become most clearly evident" (p. 316), and this is consistent with the U-shaped curve notion of the relationship between performance and anxiety. He found that high school basketball players significantly increased their foul shooting percentage following VMBR training, especially in away games. Road, conference, close, and/or important games, as well as pressure situations (e.g. bases loaded) could be some of those highly applicable situations for baseball. Lane reports two years of positive results with the VMBR technique. Similarly, some sporting activities are more dangerous than
others, and subsequently a high level of arousal may be dangerous to the athlete. Griffiths et al. (1981) divided 50 scuba divers into biofeedback relaxation, meditation, and control groups. Treatment groups had six 20-minute sessions over a two-week period. Following the treatment, the relaxation and control group differed significantly from each other on state anxiety in the expected direction. There were significant negative correlations between trait anxiety and performance and state anxiety and performance. Performance on the complex underwater task did not significantly improve after any treatment, but none of the groups may have been very anxious to begin with (which could be the result of a sort of "natural selection" for the less-anxious in scuba diving). In any case, divers not experiencing high anxiety are much safer, and it appears that relaxation may serve to reduce some of the anxiety.

Administration. One last mediating variable to consider is "who should administer PMR?" Are psychologists more effective than other professionals or paraprofessionals? Lane (1980) suggests that virtually anyone can be trained to administer the procedure. Russell and Wise (1976) found no differences between paraprofessionals and professionals in their effectiveness in implementing CCR and systematic desensitization to combat speech anxiety. They suggest that "carefully screened, trained, and supervised" (p. 586)
paraprofessionals can administer the procedure.

Results of the Research on PMR

PMR and CCR. Russell et al. (1976) added CCR to the PMR and administered that treatment, no treatment, or Systematic Desensitization (SD) to 19 test-anxious university students. The SD group reported significantly less anxiety on all three measures, while the CCR group reported less anxiety on two measures. Both groups demonstrated a drop in state anxiety as measured by the anxiety differential. In terms of performance, none of the groups showed a significant improvement on the behavioral indices, i.e. math, vocabulary, general information, digit span, and block design tests. Russell and Wise (1976) repeated the SD, CCR, and no treatment comparison, this time examining speech anxiety. They found SD and CCR significantly better than no treatment but not significantly different from each other on the self-report measures of speech anxiety. Beck, Kaul, and Russell (1978) conducted four weeks of CCR treatment with 10 women having dental anxiety. They found a significant decrease in dental anxiety, the anxiety differential, State Anxiety Scales, and systolic blood pressure. The reduced anxiety persisted during the follow-up, and that was manifest in many of the women visiting their dentists. Russell and Lent (1982) examined the effects of CCR, SD, and no treatment on test anxiety again, but strengthened this
study by adding an attention-placebo group and an SD and CCR combined group. While there were no significant changes in "course grade" for any group, the SD group experienced a decrease in test and trait anxiety, and the CCR, SD plus CCR, and attention-placebo groups reported less test anxiety. These results suggest that nonspecific factors such as suggestion and attention might be responsible for the positive effects of treatment, but Russell and Lent note that self-report measures typically are susceptible to placebo effects.

Sweeney and Horan (1982) administered either CCR, Cognitive Restructuring (CR), CCR and CR, no treatment (waiting list control), or muscle analysis training (placebo control) to 44 undergraduates enrolled in piano courses. The CCR and CR groups experienced less state anxiety after treatment, as measured by pulse rate and self-report. The CR group demonstrated a significant reduction on the Behavioral Index of Anxiety, while improved piano performance and less self-reported trait anxiety accompanied the CCR only treatment. The CCR plus CR treatment achieved all the effects its components had individually demonstrated. Neither control group showed any significant change, negating a placebo explanation for results.

In the sports context, Titley (1976) worked with a "walk-on" field goal kicker who was experiencing anxiety
and missing some important field goals. Although the
treatment was of a VMBR nature, CCR was applied in the form
of deep breathing which was cued to the relaxed state,
enabling the kicker to use the technique at will. The
kicker went on to achieve 14 Colorado State kicking
records, became the all-time kick scoring leader for his
school, and kicked the longest recorded field goal in
college football at that time (63 yards).

It would appear then, that the combination of PMR and
CCR has the effect of reducing anxiety, although the exact
mechanism for this process remains unclear. Improved
performance has been demonstrated to an extent, but future
investigations need to attend to some of the mediating
variables mentioned earlier.

**PMR with biofeedback.** As previously mentioned,
biofeedback is sometimes employed in the relaxation
procedure. The study by Owen and Lanning (1982) which
found relaxation training and attentional training to be
effective in improving maze performance and reducing state
anxiety, used microdots for biofeedback. Microdots provide
feedback to the individual on change in skin temperature.
The study of Griffiths et al. (1981) on scuba diving
employed audio and visual feedback of frontalis muscle
electrical activity. As previously noted, the researchers
found the biofeedback relaxation to be superior to
meditation and control in reducing state anxiety, but none
of the groups improved significantly on the performance task.

DeWitt (1980) conducted two investigations with relaxation, biofeedback, and cognitive training as the treatment intervention. In the first study, six relaxed university football players were given specific myographic feedback followed by cognitive training. Imagery was employed so that the athletes could visualize a hierarchy of increasingly anxious situations surrounding the game, proceeding to the next stage of the hierarchy only when their EMG levels were within 10% of their baseline measure (essentially a systematic desensitization procedure). DeWitt found that EMG feedback was effective in reducing EMG levels, and four of the six players improved in their game ratings. In the second investigation, 12 basketball players were assigned either to a control or treatment group. It appears as if the treatment intervention was essentially the same as in the initial study. Over 11 sessions, experimental subjects were able to decrease their heart rate and EMG level. They significantly improved in performance (blind ratings this time) whereas the control group's performance was essentially unchanged. Athletes from both studies reported feeling "looser" during games, and there was a decrease in the number of reported minor injuries. In a similar study by Zeigler et al. (1982), runners who were administered relaxation with EMG
biofeedback, and one of two stress management programs, experienced less anxiety (based on heart rate and oxygen consumption) and reported better performance. It should be noted that both of the preceding studies have the confound of some type of cognitive training being added to the treatment regimen.

**PMR and VMBR.** Any findings supporting the VMBR treatment strategy cannot simply be interpreted as support for PMR. Unlike CCR and biofeedback, imagery (the second VMBR component) is not included to enhance the relaxation, but is a treatment in and of itself which relies upon the relaxation to enhance its efficacy. With this in mind it is useful to examine those studies in which "half" of the treatment is PMR.

Suinn (1976) describes the relaxation phase of VMBR as being modeled after Jacobson's progressive relaxation. He first tried out the procedures in 1972 on a group of six ski racers in a controlled investigation. The control group was eliminated though, because the experimental subjects were so superior that the others did not get to race.

Hall (1983) studied the effects of VMBR with and without a "model" (a tape with a female demonstrating perfect execution and total success) on foul shooting performance in 10 female college basketball players. Only the VMBR modeling group demonstrated significant pretest to
posttest foul shooting improvement (72% to 81%). It should be noted that shooting did not occur under game conditions in this investigation.

In the VMBR investigations already discussed, Lane (1980) found improved foul shooting percentage among high school basketball players who were administered only the VMBR, and Titley's field goal kicker was successful. The high-ability tennis players in Noel's (1980) study seemed to improve, at least in terms of self-report data.

Weinberg et al. (1981) compared the effects of a modified form of relaxation, VMBR, imagery (no relaxation), and an attention-placebo condition (set of karate quotations to be studied and understood) administered to karate performers. All groups experienced a significant decrease in trait anxiety, and the imagery and VMBR groups experienced significantly less state anxiety. Only the VMBR group performed significantly better following treatment on a sparring task. Thus, some support was garnered for VMBR when it came to translating reduced anxiety into improved performance.

This sample of the literature would support the positive effects of VMBR on performance, especially with high-ability athletes. It seems as though performance itself is more positively affected when the imagery dimension is added to the PMR. This will be expanded upon later.
PMR and cognitive training. Cognitive training, like VMBR, adds a dimension to the relaxation training that makes it difficult to examine what effects are simply due to the relaxation. To make things even more complex, cognitive training encompasses a range of intervention strategies, any or all of which might be employed.

Meyers and Schleser (1980) helped a college basketball player overcome a "concentration problem" in which "irrelevant" thoughts were interfering with field goal shooting performance. The treatment consisted of seven sessions (within a three week period) of Jacobsonian relaxation and imagery (making this essentially a VMBR paradigm), and coping with unsuccessful performance in imagery through thought stopping and self-instructions (self-reinforcement, external attributions, etc.). The athlete was to practice the procedures daily, and before and during breaks in a game. The "hands on the ball" was to be a cue for relaxing and concentrating. Seven pre- and postintervention games were matched based on minutes played. Points per game, field goal percentage, field goals per game, and percentage of total team scoring all significantly increased. Free throw shooting (not a target of the treatment) decreased, calling into question generalization effects. The player was later selected in the NBA draft.

Zeigler et al. (1982) examined the effects of two
stress management programs (both preceded by relaxation and biofeedback) on oxygen consumption and heart rate in eight cross country runners. They found that Meichenbaum's Stress Inoculation Training (SIT = negative thought stopping, cuing, and positive imaging) and Cognitive-Affective Stress Management (SMT = focusing on feelings and emotions that result from imaging disastrous track experiences and controlling them with relaxation and self-statements) were both significantly more effective than no treatment in reducing oxygen consumption on the posttest treadmill run. The two treatments were more effective than no treatment in reducing heart rate only on the last half of the posttest. Because this was the point in time when the mental training techniques were being utilized, support was garnered for the effectiveness of this cognitive component in reducing physiological indicators of anxiety. This is not to say, however, that relaxation was not a necessary component of the program. Besides physiological signs of reduced anxiety, experimental subjects reported that they became more confident, better able to handle stress, and better runners.

It would be helpful to reiterate the results of two studies previously mentioned which included cognitive training, along with relaxation, as part of their treatment. DeWitt (1980) found that football and
basketball players were able to reduce EMG levels and improve performance (based on ratings) following relaxation, biofeedback, and cognitive training. Sweeney and Horan (1982) found cognitive restructuring as effective as CCR and the two treatments combined in reducing state anxiety (identified by pulse rate and self-report) among undergraduates in piano courses. The "cognitive restructurin only" subjects, however, did not significantly improve on the performance measures.

The literature to date consistently demonstrates performance improvements and anxiety reduction in those studies having some component of cognitive training. However, with the exception of the Sweeney and Horan (1982) investigation, all three studies cited previously employed some sort of imagery training and, of course, PMR. Therefore, it becomes impossible to isolate the effects of cognitive strategies in these investigations. The Sweeney and Horan study does isolate cognitive restructuring as a treatment strategy, and found it ineffective by itself in improving musical performance. When combined with CCR, the two strategies were not any more effective than CCR by itself on most indices of anxiety. It would appear, therefore, that any additional benefits derived from including cognitive training in some type of relaxation treatment are undemonstrated.
Research summary. It appears as though researchers have been able to consistently demonstrate reductions in anxiety with the PMR, CCR, biofeedback, and VMBR procedures. In some, but not all cases, these reductions translate into improved performance. While the effects of a combined treatment consisting of PMR and imagery (VMBR) are very positive (especially in terms of improved performance), the additional positive effects of a cognitive training addendum remain undemonstrated. On the basis of these results, it was decided that PMR, CCR, and imagery would be the components of the program for the current study. A more thorough discussion of the imagery component follows.

Imagery

Description of Imagery

The strategy of "imagery" has been loosely defined in the literature and rarely described in sufficient detail. In fact, researchers have trouble agreeing on an exact name for the technique. While most have decided to use the term "imagery," others have opted for "mental practice" or "mental rehearsal" (Clark, 1960; Feltz & Landers, 1983; Yamamoto & Inomata, 1982; Zecker, 1982) and still others have refrained from giving the technique a label (e.g. Millman, 1981). At a conceptual level, most authors seem to be talking about essentially the same technique, and the terms will be used interchangeably throughout this review.
That is not to say that there are not differences of major significance in imagery's application, however.

Zecker (1982) notes Richardson's (1967, p. 263) definition of the technique: "the symbolic rehearsal of a physical activity in the absence of any gross muscular movements." Singer (1982) describes imagery as "forming a mental picture of a desirable performance in an expected context...repeated practice of an act or sequence of events in the mind...(the) person is typically relaxed and tries to picture things as vividly and positively as possible...(trying to) create or construct performances and conditions as they are perceived to exist or should exist in a forthcoming event" (p. 81). Imagining competition is Millman's (1981) definition, while Gould, Weinberg, and Jackson (1980) describe the technique as visualizing oneself performing a task with a personal best on each trial. Weinberg et al. (1981) conceptualize imagery as "visualizing performance during a specific stressful situation" (p. 229), and believe relaxation is a prerequisite. In fact, all those who adhere to Suinn's (1972) VMBR approach would define imagery in a similar way (Hall & Erffmeyer, 1983; Lane, 1980; Noel, 1980). The use of tapes or films is often seen in the research as a way of facilitating the imagery (Noel, 1980; Yamamoto & Inomata, 1982; Zecker, 1982).

Therefore, within the context of athletics, general
agreement suggests that imagery is the visualization of successful performance. This is typically related to an upcoming (athletic) event, and usually is done after relaxation is achieved. It should be noted, however, that studies frequently do not specifically mention the preparatory use of relaxation during the imagery process. However, many authors believe that relaxation serves to deepen the quality of the imagery. As previously mentioned, Weinberg et al. (1981) found that their VMBR (relaxation and imagery) karate group performed significantly better on sparring than their imagery only, relaxation only, and attention-placebo karate groups. All groups experienced a significant reduction in trait anxiety, the imagery and VMBR groups had reduced state anxiety, and no effects for any group were demonstrated on heart rate, skill, and combinations. This study would appear to support the position of those who view relaxation as providing a "relaxed concentration" for imagery focus.

In imagery, the athlete is called upon to create a "well-controlled copy of experience" (Suinn, 1976, p. 41). The individual's attention is drawn to the perceptions she/he is accustomed to experiencing (Lane, 1980), and usually he/she is asked to do more than to just picture the scene. Athletes are often instructed to imagine the sounds, smells, tactile feelings, emotions, etc. surrounding the competition. For example, a baseball
player might be asked to try to smell the grass, hear the
umpire, and experience the feel of the bat, while hitting a
home run against the rival team. Jack Nicklaus refers to
going to the movies in his head before a golf stroke (Ryan
& Simons, 1982).

There is not agreement on the whether the athlete
should visualize from an internal perspective (seeing the
event through their own eyes as they would see it in
reality) or an external one (as if watching themselves from
the stands or on television). There is also disagreement
as to what type of athlete or sport (task) might best
benefit from imagery, and on pragmatic issues such as the
optimal amount of mental practice. It is these
discrepancies that will be attended to after a brief
overview of possible reasons why imagery might work.

Possible Explanations for Beneficial Effects of Imagery
with Athletes

Zecker (1982) summarizes two popular explanations for
the possible positive effects of imagery. The first
explanation states that visualizing movements results in
the same sequence of signals being sent from the brain
through the nerves to the muscles as in real performance.
In effect, there is mental and physical rehearsal of the
sequence of movements, and the memory trace is
consolidated. This approach has been called the
neuromuscular theory, the psychoneuromuscular theory, or
the ideomotor principle. The second explanation Zecker outlines is the **symbolic perceptual** one in which it is believed that imagery strengthens the "symbolic and/or cognitive aspects of the movement pattern" (p. 54). Through imagery, the baseball pitcher, for example, might become more able to remember to check the base runners and follow through on the pitch. This second theory is supported by Feltz and Landers' (1983) meta-analysis of the imagery research. They report an effect size of 1.44 on cognitive tasks as compared to .43 on motor tasks and .20 on strength tasks.

Other possible explanations for the effectiveness of imagery include the belief that imagery gives the athlete an opportunity to rehearse under the conditions that he/she will compete (i.e. the competitive situation is simulated), and that this may lead to increased confidence. Also, imagery may aid the athlete in learning to focus attention on the task relevant cues. Feltz and Landers (1983) describe the last two explanations as psychological preparation, proposing that mental rehearsal serves to set arousal and attention at the optimal level. Finally, imagery might be an effective placebo treatment in that it seems to have high face validity for the athlete.

Nideffer (1981) proposes the use of imagery in discriminant cue analysis in which the athlete reexperiences contrasting (in terms of success)
performances in order to identify cues (mental and physical) that influence success of performance. Similarly, Suinn (1972) reports that slowing down the actual visualization may help the athlete to correct errors she/he may be making. He reports that one of his ski racers was able to realize the cause of her falls as a function of the imagery process.

The study by Zecker (1982) focused on the psychoneuromuscular and symbolic perceptual explanations. He had subjects assigned to one of four groups: mental practice, physical practice, control, or physical practice without knowledge of results (i.e. the lights were turned out). The final group was not permitted any visual or auditory feedback on the success of their toss in this bean-bag-throwing experiment. The physical practice group experienced a decrement in performance whereas the mental practice group improved significantly. The other two groups showed nonsignificant improvement. Psychoneuromuscular theorists would have predicted similar results for the mental practice and physical practice without knowledge of results groups. Subjects reported employing both verbal strategies and visual imagery during mental rehearsal. Thus, some support was garnered for both theories, along with the possibility that they might work in combination. Zecker also suggests that mental imagery might be best used in massed practice situations, and most
beneficial when one is sufficiently experienced with the task. Regarding limitations, the study did not consider a combination of mental and physical practice, and the task itself seems fairly simplistic. Zecker reports also that the physical practice group without feedback may have had more incentive since the lights were turned out, and that this same group had less rest than the mental practice condition. He considers the "rest" important here and explains the decrement in the physical performance group as reactive inhibition resulting from little rest.

Actual detection of this slight change predicted by the psychoneuromuscular theory may require sensitive equipment. Hale (1982) reports Jacobson's (1931) use of needle electrodes to support this theory. Jacobson found that there was activity in the muscles imagined to move when the focus was internal, and activity in the ocular region when the imagery was essentially external. Suinn (1976) noted that EMG recordings of one of his ski racers during imagery "mirrored the course itself." Similarly, Hale (1982) reported greater bicep activity (with EMG instrumentation) during internal (imagine how it feels) rather than external (imagine what it looks like) imagery. His subjects were experienced and unexperienced weight lifters who did bicep curls for him, rested either 5 to 10 or 25 to 30 minutes, and then went through the mental rehearsal aided by films. There were no differences due to
experience or recency of lift, and no internal vs. external effects on ocular activity. Despite this, one of the propositions of Feltz and Landers' (1983) meta-analysis of mental practice research is that the psychoneuromuscular theory may not be valid because other studies have suggested that activity during imagery is distributed throughout the body and not localized in the muscles specific to the activity.

Mediating Variables in Imagery

Perspective. Many researchers argue that internal imagery is the only type of imagery which may prove to be beneficial to the athlete. It has already been noted that Hale's (1982) weight lifters experienced greater bicep activity during internal imagery, thus supporting internal imagery from a psychoneuromuscular perspective. Mahoney and Avener (1977) tried to differentiate between the seven athletes selected to the U.S. Men's Gymnastics Team, and the six who did not make the squad. They found that the selected gymnasts had a higher frequency of gymnastic dreams with moderate success. While all 13 reported using imagery, the better athletes were more likely to employ internal imagery. Weaknesses of the study include the small, elite, male sample and the correlational design. As with most studies in the field, it focused on a single sport.

In a similar study, Hall and Erffmeyer (1983) compared
the effects of VMBR with modeling and VMBR without modeling on the basketball foul-shooting of 10 female collegians. It was found that the VMBR modeling group improved significantly (72% to 81%) while the other group did not. What is important here is that the improved group reported an internal perspective in visualization and kinesthetic sensations. This suggests that the videotaped model may enhance these techniques. They also implied that imagery is more effective with experienced performers, and that rehearsing these kinesthetic sensations for a particular sport helps to keep imagery internal and improves auditory and olfactory sensations. Problems with the study include its lack of control for attention, the small number of subjects, and the idea that the "perfect form" of the model would fit for everyone.

The Gould et al. (1980) study will be discussed in detail later, but is cited here because apparently their instructions had participants engaging in external imagery. Results of the within-subjects experiment indicated support for the notion of improved performance resulting from imagery, but a between-subjects repetition showed no significant improvement for the imagery group.

**Ability level.** There has been some controversy over whether imagery is most applicable to the elite athlete or the novice. Is it most effective when one is learning or when one is perfecting a skill? Several authors already
presented such as Suinn (1972) working with Olympic skiers, Hall and Erffmeyer (1983) working with intercollegiate basketball players, and Mahoney and Avener (1977) working with the U.S. Men's Gymnastic Team, have reported successful results with imagery. In fact, in the latter, the elite of the elite used internal imagery more frequently. As was mentioned earlier, Noel (1980) found that high-ability players significantly improved on their first (tennis) service with VMBR practice while low-ability players got significantly worse. The same effects were noted for self-assessment of service performance. Noel concluded that mental practice is more effective for high-ability performers. Consistent with these findings, Yamamoto and Inomata's (1982) novice swimmers did not benefit from the use of imagery.

Conversely, Lane (1980) argues that imagery can be used at any level of any sport. Zecker (1982) states that going through imagery after much learning will have little effect because the perceptual trace is already established. Finally, Feltz and Landers' (1983) examination of the research showed in general that the effects of mental practice were found in both the early and late stages of learning, "and may be task specific" (p. 48). In the early stages of learning, it may give the athlete a "rough schema," and in the later stages the schema can be more fully developed.
It is possible that a confounding variable exists in this elite versus novice issue. Highlen and Bennett (1979) examined wrestlers competing for positions on three Canadian World Wrestling Teams. Both qualifiers and nonqualifiers reported using imagery to about the same, moderate degree. Highlen and Bennett discuss the differences in the results of their study of elite wrestlers and Mahoney and Avener's (1977) research on elite gymnasts (where qualifiers reported greater use of internal imagery) in terms of open versus closed-skill sports. It might be that when the athlete performs in a constant, stable environment (closed-skill sports such as gymnastics) imagery is more useful than when the athlete has to interact with a changing environment (open-skill sports such as wrestling or baseball). Highlen and Bennett (1983) gathered support for that hypothesis in a follow-up study of elite divers (closed-skill) and elite wrestlers (open-skill). Although there were no significant differences between the divers and wrestlers on the imagery scale, qualifying divers for the Canadian Team were distinguished from nonqualifiers by their greater use of, vividness of, and control over imagery. Thus, as expected, the presumably better athletes in the closed-skill sport of diving made better use of imagery, while both qualifying and nonqualifying open-skill wrestlers employed imagery of comparable quality to the same extent.
Similarly, Feltz and Landers (1983) mental practice meta-analysis indicates that self-paced (closed-skill) tasks had a larger effect size (.58) than reactive (open-skill) tasks (.38), although the difference was nonsignificant. It is also interesting to note that in the cited examples of imagery success with elite athletes, all involved closed-skill sports (gymnastics, and perhaps skiing) or a closed-skill aspect of an open-skill sport (foul-shooting in basketball). There may be components of some open-skill sports more amenable to imagery.

Finally, potentially more important than the ability level of the athlete in the particular sport is the athlete's ability to visualize. Ryan and Simons' (1982) subjects who reported strong visual and kinesthetic imagery were significantly superior to weak imagers on the stabilometer task. Clark (1960) reports similar results. It also seems, however, that physical practice and mental rehearsal lead to more vivid and accurate imagery (Yamamoto & Inomata, 1982).

**Timing.** The length of an imagery session, the number of trials in a session, and the total number of sessions have not been consistent across the imagery research. In some instances, the research may inadequately assess the validity of the imagery procedure in that the individuals conducting the studies may be seeking economy of time by shortening the visualization process. Hence, it would be
impossible to attempt to describe the average number of trials, sessions, etc. due to the wide range of applications in the research. It can be said, however, that only the Weinberg et al. (1981) study requiring six weeks of 10 minutes/day practice, measured up to the standards Russell (1984) recommends and implements with the OSU diving team.

It appears as if many researchers fail to recognize the importance of these procedural variables due to the failure to describe them as part of the method. Nevertheless, Feltz and Landers (1983) report that while the number of sessions of imagery does not correlate highly with the effectiveness of imagery, the length of the session and the number of trials seem to be important. Specifically, they discovered that imagery was most effective when the length of the session was less than 1 minute or 25 to 30 minutes, and when the number of trials per session was less than 6 or between 36 and 46. The large effects for cognitive tasks were associated with short practice sessions and few trials. Thus imagery might best increase performance with little time/trial investment (cognitive tasks) each session or considerable investment (motor and strength tasks). Feltz and Landers' results might provide a way of accounting for much of the variability in the research in terms of imagery's effectiveness.
Results of the Research on Imagery

Does imagery work? About 100 hundred studies have been conducted since the 1930s, many of those in the 1960s and 1970s (Feltz & Landers, 1983). Hall (1983), Noel (1980), Mahoney and Avener (1977), and Zecker (1982) would all probably conclude that "imagery is effective." Highlen and Bennett (1979) postulated a distinction between open and closed-skill sports regarding imagery's effectiveness. The Weinberg et al. (1981) study of karate performers was unique in that it had an attention-placebo condition and showed support for the effectiveness of only the "relaxation combined with imagery" condition. Previously cited VMBR studies by Lane (1980) and Suinn (1972) support the positive effects of relaxation and imagery. Lane claims that he has achieved only positive results in two years of work with relaxation and imagery. He was able to significantly increase the foul-shooting percentage of high school basketball players through VMBR. Suinn administered the VMBR technique to six ski racers, and the effects were so positive that his control group was eliminated from the study because they could not compete with the experimental subjects. Suinn (1976) reports that other countries such as the Soviet Union make greater use of this psychological training, and this becomes pronounced in the Olympics.

Ryan and Simons (1982) conducted a study involving male traffic officers trying to balance themselves on a
stabilometer. The dependent variable was the degree of tilting, and the three groups were composed of imagers, occasional imagers, and officers who did not typically employ imagery. Half each of the imager and nonimager groups were instructed to engage in imagery and the other half were prevented from doing so. The occasional imagers either went to a control, no practice condition or a physical practice condition. Ryan and Simons found that regardless of proclivity for imagery, subjects instructed to image showed significantly greater improvement than the subjects asked not to image, but both were less successful than the physical practice group. Stronger visual or kinesthetic imagery was associated with greater improvement. Thus, this controlled study with reasonable sample sizes (8 to 16 per group) demonstrated imagery's effectiveness. The task, however, was rather simplistic, the imagers asked not to employ their skill sometimes did, and possible placebo effects of imagery cannot be discarded.

In a study of the effects of mental practice versus physical practice on 144 high school boys shooting the Pacific Coast one-hand foul shot, Clark (1960) found that both groups showed significant gains. The group that imagined shooting 5 warm-ups and 25 shots over the 14-day period improved nearly as much as those who physically practiced. Clark reported a strong relationship between
the amount of improvement and the ability to visualize the skill. All imagery subjects reported getting better at the mental practice, and 66 of the 72 had more confidence in their ability. Clark discusses the superiority of an ideal combination of physical and mental practice.

Gould et al. (1980) compared the effects of imagery, attentional focus, preparatory arousal ("psyching up"), control-rest, and counting-backwards (cognitive distraction) in a within-subjects experiment and in a between-subjects experiment. The dependent variable was leg strength. In the within-subjects experiment, imagery and preparatory arousal worked significantly better than the other three techniques. Since confidence was derived from imagery, preparatory arousal, and attentional focus, placebo effects might be discounted. In the second (between-subjects) experiment, however, only preparatory arousal was significantly better than control, and imagery was not significantly better than any other treatment.

Yamamoto and Inomata (1982) divided 36 undergraduates learning the backstroke into three groups: mental rehearsal with whole model, mental rehearsal with progressive part model, and control. Subjects in the imagery groups twice viewed five minutes of film and then mentally rehearsed for five minutes over a seven-day period. The physical practice was significant in improving the imagery and swimming, but the mental rehearsal
apparently had no effect. It should be noted, however, that the description of the application of the imagery would lead the reader to believe that it was external in nature.

It appears as if most of the surveyed studies support the effectiveness of imagery in enhancing performance. This does not necessarily mean that imagery "works." It should be noted that this review does not purport to have surveyed all of the applicable publications, or even a random sample of them. Furthermore, investigations with significant findings are overly represented in the literature. Feltz and Landers (1983) report that the effect size for published studies is nearly double that of the unpublished studies. The two authors are much less kind to the imagery technique, reporting an effect size of .48 for the 60 studies they considered, and concluding that "mentally practicing a motor skill influences performance somewhat better than no practice at all" (p. 41).

Furthermore, some of the particular weaknesses of the various studies emerged and were identified during the descriptions of the research. In more general terms, Noel (1980) and Suinn (1976) said there is a lack of experimental support for the procedure, and Weinberg et al. (1981) cite the high number of case reports. Lane (1980) proposed that we are missing formal research to determine which elements are most important. Only Weinberg et al.
(1981) had an attention-placebo condition in their research. Most striking is the inconsistency in the administration of imagery. In the studies examined, the timing of imagery varied widely, relaxation or modeling may or may not have been used, and an internal or an external perspective may have been promoted. Tasks are sometimes simple, sometimes complex, and the sports themselves are sometimes open, sometimes closed.

**Summary**

It seems as though imagery has some demonstrated value in performance enhancement, and at the very least, it does not have any noteworthy negative effects. There is negligible difference between its influence on males versus females (Feltz & Landers, 1983). Imagery is apparently applicable to both the novice and the expert, perhaps for different reasons, as is the case with relaxation training. The novice may overcome anxiety associated with the learning by way of relaxation, and through imagery may develop the "rough schema" Feltz and Landers (1983) speak of. The expert may use imagery for fine-tuning, and relaxation to maximize the performance of the well-practiced skills. Imagery was thus included in the present baseball program, bearing in mind the research which suggests that open-skill sports such as baseball are less supported by the procedure. PMR preceding the imagery is commonly recommended, and that, of course, was employed
in the current study. Visualizing from an internal perspective seems to be the strategy of choice, and insuring that internal perspective consequently became an emphasis of the program. Also, given that batting and pitching are largely "motor and strength" type activities, an attempt was made to have as many imagery trials as possible each session, with at least 30-minute sessions.

Millman (1981) states that "competitive success is 99% mental" (p. 52), and Singer (1982) proposes that "mental processes must be trained just as sports skills and tactics" (p. 88). It makes sense that a more holistic approach to training would include both physical and mental preparation.

**Design**

The current investigation employed a one-group pretest-posttest design, and consequently conclusions are limited. The baseball data from the season preceding the PMR, CCR, and imagery treatment program was compared to the data from the season immediately following the intervention. Thus, the independent variable was the treatment program, and the dependent variables were various baseball statistics.

Batting and pitching were the two target activities of the treatment, primarily because they are the core skills of the game of baseball. In fact, batting and pitching (along with base running and defense) constitute the entire
game. They also are areas in which there is much room for improvement and in which improvement can be easily quantified. It is difficult to improve a 95% defensive fielding average, and equally difficult to measure base running ability, except through stolen bases. Batting and pitching are also more structured and amenable to the treatment procedures.

A statistic which reflects average batting performance (discussed in detail in the Method section) was calculated for each batter for both seasons, and three pitching statistics (earned run average, earned hit average, and the ratio of strike outs to walks) were calculated for each pitcher for the two seasons. This, of course, necessitated restricting these comparisons to players who performed in both campaigns. It was hypothesized that batters would become more successful as reflected by a higher average in the postintervention season, and that pitchers also would be more successful as measured by lower earned run and earned hit averages, and a higher ratio of strike outs to walks in that second season. Presumably, improved performance would result from being able to achieve and maintain an optimal level of anxiety during game situations, and from the effects of mental rehearsal (imagery). Of course, comparisons between seasons involve the implicit assumption that the players faced reasonably equal competition in those two consecutive seasons. There
is support for that assumption, in that 77% of the games played in 1984 were against teams met in 1983, and that the same conference schedule occurred. Because there seems to be less variability in team ability level from year to year in college baseball as compared to a sport such as college basketball, the proposition of reasonably equal competition those two years is further strengthened.

Furthermore, because of this high degree of similarity between the opposition of the two seasons, because of the greater-than-expected degree of similarity between the OSU teams of the two seasons (see Table 1), and because nearly everyone participated in the intervention program, comparisons were made between the pre- and posttreatment teams on the statistics cited above. Hypotheses for the team totals were identical, as it was expected that the team averages would naturally improve with improving player averages. It was also predicted that the team won-loss record would improve for the season following the treatment.

All of these aforementioned statistics were calculated for the pre- and posttreatment seasons (for comparison purposes) for: (a) all games, and (b) conference (Big Ten) games (see Footnote 1). In the case of the conference games, the same universities were played in both seasons, making the comparisons more direct. In addition to the overall and Big Ten won-loss records, the won-loss records
against all opponents played both in 1983 and 1984 were compared for the two seasons.
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\(^a\) Based on top 10 in total number of "at bats."

\(^b\) Based on top 7 in total number of innings pitched.
METHOD

Participants

The Ohio State University Head Baseball Coach was introduced to the treatment program in the Autumn preceding the posttreatment season. He believed that the PMR, CCR, and imagery training could be of value to many of his players and agreed to give his support. It was decided to offer the program to all players on a voluntary basis.

All 34 baseball players attended the initial introductory session in which the procedures were briefly described, the rationale was presented, background information was given, and the time commitment was explained. Each of the players declared an interest in participating at that time. All of the players were full-time undergraduate males at the Ohio State University, ranging in age from 18 to 22.

The treatment phase of the program began in January, 1984, during the second week of preseason indoor practices. A total of 27 players attended the first week of the treatment program. After nine weeks of treatment sessions, 24 players had missed no more than two of the sessions, and were thus considered to be qualified participants in the investigation. Of the 24, 2 players left the team (1 due
to an injury), and a 3rd was not eligible to play because of his transfer from another school. Thus, the total number of participants who went on to compete for a full season was 21.

Attrition is a common phenomenon in college baseball, in large part due to time demands, injuries, and the strong competition for playing time. While some of that attrition may have affected the current program, the 21 players who participated in this training and remained on the team accounted for 94% of the "at bats" (97% in conference games) and 80% of the "innings pitched" (81% in conference games). Of the 12 sessions conducted (2 "refresher" sessions occurred during the season itself), none of the 21 participants missed more than 2 sessions, and as a group the 21 had an impressive 92% overall attendance rate. Some of the 6 players who completed the season but did not actively participate in the treatment may have had time conflicts (although every attempt was made to accommodate each player), or simply may not have been interested in the program. All of the 6 attended at least a couple of sessions. Overall, it is reasonable to conclude that the study had team participation, thus allowing consideration of team statistics.

**Treatment Program**

**Overview**

As previously stated, a total of 12 sessions were
conducted, with the first being an introduction and the last 2 being refresher or "booster" sessions identical to the 10th session. During the 9 sessions (1 per week) following the introduction, players were permitted to attend either one of the two scheduled (identical) meetings for their position. While it was initially unnecessary, pitchers and batters attended separate meetings (identical until session 7 when minor changes were instituted). Thus, at least four 45-minute meetings were conducted each week, with an average of about five players in each group. Additional make-up meetings were offered during weeks when attendance was low. The author, trained in the administration of the techniques by an experienced sport psychologist, facilitated all meetings. Attendance was voluntary and not reported to the coaching staff, but occasionally players were telephoned to set up additional meetings, or to inquire whether they were planning to continue in the program.

Nearly all of the nine sessions which occurred during the main part of the program were held in the same locker room in the basketball arena. It was necessary to move to another locker room on one occasion, and to the field house on still another occasion. The locker room was fully carpeted, and could be dimly lit by turning the main lights off while leaving the rest room lights on. A chalkboard was available for weekly 5 to 15 minute (decreasing each
week) discussions which occurred prior to the relaxing. This was also a time for feedback from the players, although they were usually rather reluctant to offer any unsolicited comments.

Players were instructed to wear comfortable clothing. Often they were coming to the sessions directly from an indoor practice, but would shower and change before the session began. Before beginning the procedures, players were asked to get in a comfortable position on the floor, using anything they wished as a pillow. Shoes, glasses, contact lens, watches, etc. were to be removed if the player thought that they might interfere with his relaxation. The players were asked to keep their eyes closed during the entire session and move around as little as possible.

During the second session participants were told that they would be taught how to (a) recognize tension, and (b) eliminate tension (i.e. relax). Only PMR was introduced in this second session (refer to Table 2), and the procedure used throughout closely resembled the procedure previously described (i.e., Bernstein & Borkovec, 1973). Each player was given a handout (see Appendix B) which described how to create tension in each of the 16 muscle groups, and summarized three key points about PMR: (a) that it is a skill and requires 20 to 30 minutes of daily practice, (b) that it has both mental and physical components, and
<table>
<thead>
<tr>
<th>Session</th>
<th>PMR</th>
<th>CCR</th>
<th>Imagery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>---Overall introduction before Christmas break---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Introduced (16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>7 muscle groups</td>
<td>Introduced</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6 muscle groups</td>
<td>Continued</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6 muscle groups</td>
<td>Continued</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4 muscle groups</td>
<td>Continued</td>
<td>Introduced</td>
</tr>
<tr>
<td>7</td>
<td>4 muscle groups</td>
<td>Continued</td>
<td>With action (4)</td>
</tr>
<tr>
<td>8</td>
<td>RR introduced(^a)</td>
<td>Continued</td>
<td>Repeated 5 times</td>
</tr>
<tr>
<td>9</td>
<td>RR only(^b)</td>
<td>Continued</td>
<td>Repeated 7 times</td>
</tr>
<tr>
<td>10(^c)</td>
<td>RR only</td>
<td>Continued</td>
<td>Repeated 7 times</td>
</tr>
<tr>
<td>11</td>
<td>----Refresher session same as session 10----</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>----Refresher session same as session 10----</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Recall relaxation with the 4 groups (2nd tensing).

\(^b\) Instructed to begin using CCR in low-anxiety situations.

\(^c\) Instructions given for using the techniques in games.
(c) the details on tension and relaxation periods. A demonstration of the tensing of each muscle group was then presented.

Practicing the various treatment procedures on a daily basis was emphasized throughout the program, although during the baseball season four to five times per week was described as acceptable. During the 10th session, each participating player was given a cassette tape which he could use on his own. The tape was simply a recording (different for batters and pitchers) of what players heard in the 10th treatment session.

**Progressive Muscle Relaxation**

Progressive muscle relaxation was always the first step in the sessions. After getting comfortable, players were asked to shut out all other thoughts and to focus on their breathing. Beginning with the hands and working towards the feet, each of the 16 muscle groups (combined into 4 by session six) were tensed and relaxed twice. Tension periods lasted 10 seconds (slightly less with the feet) as suggested by Russell (1984), during which time "patter" phrases were louder and more intent while describing what the individual should be feeling. "And relax" was the cue to begin the 45-second relaxation period, during which time a softer, slower, and more relaxed tone of voice was used for relaxation patter. In general, as the session progressed, the phrases became more
soft, slow, and relaxed. Finger-raising to indicate complete relaxation (as suggested by Bernstein & Borkovec, 1973) was not utilized, mainly because of the group setting.

In the eighth session, recall relaxation was introduced as a replacement for the standard PMR procedure. Players were asked to concentrate on the tension in each of the four muscle groups (one at a time with two repetitions), to get that tension clearly in mind, and to begin to hold the tension there. Ten seconds of silence was followed by "and relax...recalling now the feelings of relaxation," and 45 seconds of relaxation patter just as before. During session eight, actual physical tension was employed on the first cycle with each group, while recall relaxation was used for the second cycle. Subsequent sessions employed only recall relaxation on both cycles, and some players reported being the most relaxed they had ever been.

Cue-Controlled Relaxation

In the third session, cue-controlled relaxation was introduced along with its accompanying rationale. It was explained that after several weeks of practice the cue word should elicit the feelings of relaxation by itself, but that players should not attempt to employ it until asked to do so, following session nine.

After going through the PMR procedure in the third and
subsequent sessions, one minute of general relaxation patter (referring to various muscle groups and asking that any "residual" tension be made to go away) was followed by the CCR. After one and one half minutes of cue-word pairings, general relaxation patter was once again employed for one minute, and then the procedure was repeated beginning with the CCR instructions. When imagery was included in the program (session six), it was introduced between the two presentations of CCR.

The CCR procedures were always delivered twice in a session, and the second administration was always the last item on the agenda. After the last one and one half minutes of subvocalizations and the ensuing minute of general relaxation patter, players were asked to focus once again on their breathing. They were instructed to slowly let life flow back into their muscles as the air flowed into their lungs, and then to move around and get up whenever they were ready. Players were generally very slow to get up even after the lights were turned on. A very brief period of processing the session concluded the activities.

**Imagery**

Imagery was introduced in session six as a method of mentally rehearsing skills under game conditions, an opportunity to discover and correct errors in movement, and a way to solidify the memory (trace) of a sequence of
movements and thoughts. Imagery as an aid in focusing on task relevant cues and strengthening symbolic/cognitive components of the baseball task was presented in session eight, where players were asked to think about such things as the checking the base runners, score, count, and defensive alignment; noticing the shift of the weight during the hit/pitch; and dropping the bat or getting ready to play defense after the hit.

Imagery was positioned between the two sets of CCR pairings. Players were told that they would be asked to imagine a pleasant or neutral scene (preferably from their own experience) that was in no way anxiety-arousing. They were then told that they would be asked to visualize themselves sitting in the dugout during a game. Players were instructed to use an internal perspective (i.e. seeing through their own eyes); to imagine with as many of their senses as possible (i.e. see, hear, smell, and feel the scene); and to produce as much detail, vividness, color, and clarity as they were able to. They were told that during the dugout scene they should try to: (a) see things such as the dugout and the other players; (b) smell the spring air and the grass; (c) hear the sounds of the umpire, the fans, the players, the coaches, and the outdoors; and (d) feel the dust, the uniform, and the warmth of the sun.

After a minute of general relaxation patter following
the first presentation of CCR, players were told: "use all of your senses and through your own eyes and in as much detail as possible, begin visualizing your neutral or pleasant scene now." The 20-second period of silence was terminated with "stop that image" and 30 seconds of relaxation patter. In the first session which included imagery, the neutral scene was visualized again followed by one minute of patter. The same sequence then followed for the dugout scene, except that some of the specifics the player might try to attend to were described.

In session seven and all remaining sessions, the neutral and dugout scenes were presented once each, followed by four to seven action scenes (see Table 2). Forty-five seconds of general relaxation patter occurred between all imagery scenes. The first action scene for batters was introduced as follows:

"Now I want you to visualize yourself warming up on deck, noticing how the bat feels, how the uniform feels... (about five seconds of silence)... hearing the sounds of the game as you now make your way to the batter's box... positioning yourself at the plate and readying yourself for the first pitch... for the next minute I would like you to imagine receiving a few pitches, each time hitting the ball exactly how you want to and where you want to, and reaching base (i.e. having total success)... now focusing in on the pitcher
and beginning the imagery now."

Pitchers heard:

"Now I want you to visualize yourself on the mound, focusing on the sounds of the game...as a batter approaches the plate and positions himself in the batter's box get in touch with the feel of the mound under your feet and the feel of the ball and glove in either hand...now seeing the catcher's mitt and getting ready for your first pitch...for the next minute I would like you to imagine a few pitches, placing the ball exactly where you want it and at just the right speed such that the batter misses, takes a strike, or makes an out...now focusing in on the catcher's mitt and beginning the imagery now."

The three to six one-minute action scene repetitions that followed had much shorter introductions stressing either vividness, detail, and success in imagery, or tasks that require thoughtful attention in games. Obviously, it was at this point that separate meetings for the two groups for each session were essential. With the exception of these imagery instructions, batter and pitcher meetings were identical.

Players were asked to vary the type of pitch and the game situation within each presentation of the procedures, and to vary being home versus away and the opposition between presentations. Freshmen were instructed to draw
upon high school experience if they were having trouble getting an "OSU" image, and slow-motion visualization was recommended to anyone who was having difficulty with the imagery. The imagery itinerary and all of its details were developed in consultation with Russell (1984) and the players.

The Final Three Sessions

In the last treatment session before the baseball season began and in which every procedure was in its final form, players were instructed on the *in vivo* application of the various techniques. Players were told that they might experience an overall reduction in anxiety from the relaxation, and improved performance from the imagery. It was explained that they now had two techniques with which to reduce excessive anxiety. CCR could be used in situations where time was of the essence (e.g. between pitches) and recall relaxation could be used when more time was available (e.g. between innings) or when a specific group of muscles was problematic. While batting and pitching were the target areas, players were advised that they could employ the procedures as needed on defense or off the baseball field, such as during tests. The inverted-U shaped curve of anxiety was presented, and players were instructed to use relaxation techniques *only* when they felt they were at the right end of the curve (excessive anxiety and subsequent poor performance), and
then only to bring them back to a slightly anxious level. The possibility of using the procedures the night before the game to relax or fall asleep was discussed.

One month following the 10th treatment session, a refresher or "booster" session was provided. Because of schedule difficulties, it was necessary to have the entire team go through the procedures together during a practice. This involved modifying the imagery instructions somewhat to work for both batters and pitchers. The session was held on the infield grass, meaning that the environment was less conducive to relaxation than recommended. The players were encouraged to continue practicing on their own to maintain the skills. One month later another refresher session was conducted. It was identical to the first, except that imagery instructions were further modified to focus on the final, important games.

**Dependent Variables**

**Batters**

Since the objective was to help batters improve their performance at the plate, it was important to develop a statistic which would take into consideration all successful plate performances. In addition, not all successful at bats are equally prosperous (i.e. every baseball player would prefer a home run to a single), and therefore a statistic which would unequally credit differing successes was desired. The closest common
statistic baseball routinely offers is the batting average. However, the batting average does not consider walks and sacrifices (where the batter has succeeded) to be performances at all, nor does it differentiate between the different types of hits. The batting average is simply the number of hits a player has, divided by the total number of plate appearances (minus the times she/he was walked, was hit by a pitch, or sacrificed). Also, examining these measures separately is not feasible because they are interdependent. For instance, if a player is hitting the ball well, her/his number of walks may decrease.

The "Successful Performance Average" (SPA) was thus created to meet both of the aforementioned conditions. A player's SPA is equal to the sum of all of the walks, sacrifices, singles, doubles (multiplied by two), triples (multiplied by three), and home runs (multiplied by four); divided by the total number of plate appearances (including walks and sacrifices but excluding occasions when the player was hit by a pitch). This statistic can range from zero to any positive real number for any player, but will almost always be less than one. Greater numbers are associated with greater success. The player who hits a home run in his/her first trip to the plate will have a SPA of four divided by one, or four. If she/he strikes out in her/his next trip, the SPA will become four divided by two, or two.
The SPA considers singles, walks, and sacrifices to be equally successful plate performances. The first two involve reaching first base, and similarly, the last involves enabling a teammate to advance one base. Extra-base hits (which require more successful ball placement) are weighted according to how many bases the player reaches. The more bases, the more successful the at bat is considered to be, and the larger the increase in the numerator of this statistic. While it might be difficult to get all coaches to agree that the home run (four) is equivalent to two doubles (two) or four singles (one) as is the case in the SPA, everyone should agree that this equivalency holds in terms of "total bases."

**Pitchers**

Earned Run Average (ERA) is the most commonly used measure of pitching performance. A pitcher's ERA is equal to the total number of earned runs (not the result of errors), divided by the number of innings pitched, which is then multiplied by nine to produce an average number of earned runs per nine-inning game. Lower ERAs are associated with more successful performances. This statistic was used in the current study along with what was termed an Earned Hit Average (EHA).

The EHA is analogous to the ERA (and calculated in the same manner), in that it represents the average number of hits surrendered per nine innings. While there should be a
high correlation between the ERA and the EHA, it is conceivable that one could improve without the other. The pitcher could come to space the same number of hits per game further apart (which would probably bring the ERA down), or could already have a very low ERA and only be able to improve on the number of hits he/she is allowing.

One final pitching statistic which was calculated was the ratio of strike outs to walks (K/W). A strike out is the most desirable kind of out for a pitcher, because there is no chance for an error by the defense or another runner advancing on a sacrifice. An unintentional walk, on the other hand, is the pitcher's albatross. Every pitcher has heard the words: "Those walks will come back to haunt you (i.e. score)," and found that to at least occasionally be the case. A high ratio of strike outs to walks is desirable, is a indication of good pitching control, and is probably correlated with low ERAs and EHAs. Intentional walks were considered along with unintentional walks in calculating this third pitching statistic simply because it is impossible to sort them into the two categories (some walks that appear to be unintentional actually are not because the pitcher is not giving the batter anything to hit). It was assumed that intentional walks were, for the most part, distributed evenly among members of the pitching staff. A 1:1 K/W ratio is frequently spoken of as acceptable.
Additional Comments

All of the batting and pitching statistics were chosen to maximize the control the individual player has over his own numbers. For instance, runs-batted-in was not included as a measure because it is largely dependent upon whether batters in front of the player of interest get on base. A pitcher's won-loss record is a function of how many runs his/her teammates produce for him/her. Granted, calculation of the chosen statistics for any particular game or series of games would be dependent in part upon how well the opposition was playing. The batter might run into a well-positioned and practiced defense, and the pitcher might have to face a group of highly-skilled hitters. Over the entire season, however, the quirks of these samples should disappear into the larger picture, and these statistics calculated at year's end should more closely approximate the player's true ability. Given two successive seasons of reasonably equivalent opposition (as was the case here), a change in ability could be detected by a significant change in SPA, ERA, EHA, or K/W.

All of these statistics can be calculated for an individual player, a group of players, or a team, across any given period of time or number of games. In the current investigation they were calculated for (a) 1983, and (b) 1984; for (a) the overall season, and (b) the Big Ten season; for (a) participants who saw action in both
years (as a group, and individually for the purpose of t-tests), and (b) the team. It should be noted that the won-loss record (overall, Big Ten, and common opponents of the two years) was a team statistic also considered.

A questionnaire was distributed to participants three weeks after the season ended for the purpose of evaluation of the treatment program. There were negligible differences between the batter and pitcher versions, and the former is presented in Appendix C.
RESULTS

Following a comparison of batting and then pitching performance for the pre- and posttreatment seasons, the change in the won-loss records of the team will be examined. Finally, self-report data will be presented.

It should be noted that, for various reasons, formal statistical analyses were generally not conducted on the data in this study. Due to its exploratory nature, this investigation was plagued with little control and small sample sizes. Within the small samples, which were even smaller for the pretest-posttest participants, there were considerable differences in the size of each player's contribution. For instance, starters accounted for most of the plate appearances and innings pitched while other players received limited playing time, and the data on the latter was therefore much less reliable as a measure of true ability. T-tests equally weigh the data of each player, and consequently compare the mean performance of all players for the two seasons. A group or team baseball statistic, however, is calculated as if the data came from one individual (i.e. disproportionately weighing unequal contributions), and is a more accurate representation of
the group/team's performance. Furthermore, when comparing the entire teams of the two seasons, one difficulty that arises is that there is a portion of the two "samples" that is related (i.e. players who competed both seasons), and a portion that is not.

**Batting Performance**

The group Successful Performance Average (SPA), and the team SPA data are presented in Tables 3 and 4. The group SPA considered only treatment program participants who competed in both the pre- and posttreatment seasons, while the team SPA incorporated every player.

Table 3 reveals that, for participants, the group SPA for the overall season decreased from .548 to .511 following the intervention, while the Big Ten group SPA declined from .445 to .414. These were rather small changes in the unexpected direction. Related-samples t-tests (which ignored differing numbers of at bats for players) on the SPAs of the pretest-posttest participants for both the overall season ($t[10] = -0.02; p>.05$, left-tailed) and the conference season ($t[9] = -0.15; p>.05$, left-tailed) were nonsignificant.

Similar changes occurred in the team SPAs, as displayed in Table 4. The team SPA for all games was somewhat lower for the posttreatment season, moving from .558 to .503. The Big Ten team SPA was also reduced, from .492 to .423. Thus, none of the changes in group or team
Table 3

Statistics for Participants Competing in Both Seasons

<table>
<thead>
<tr>
<th>Category</th>
<th>1983</th>
<th>1984</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall SPA</td>
<td>0.548</td>
<td>0.511</td>
<td>-0.037</td>
</tr>
<tr>
<td>Big Ten SPA</td>
<td>0.445</td>
<td>0.414</td>
<td>-0.031</td>
</tr>
<tr>
<td>Pitchers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall ERA</td>
<td>5.05</td>
<td>4.88</td>
<td>-0.17</td>
</tr>
<tr>
<td>Big Ten ERA</td>
<td>7.98</td>
<td>4.92</td>
<td>-3.06</td>
</tr>
<tr>
<td>Overall EHA</td>
<td>8.57</td>
<td>8.49</td>
<td>-0.08</td>
</tr>
<tr>
<td>Big Ten EHA</td>
<td>11.86</td>
<td>8.86</td>
<td>-3.00</td>
</tr>
<tr>
<td>Overall K/W</td>
<td>1.23</td>
<td>1.51</td>
<td>+0.28</td>
</tr>
<tr>
<td>Big Ten K/W</td>
<td>0.69</td>
<td>1.53</td>
<td>+0.84</td>
</tr>
</tbody>
</table>
# Table 4

**Team Statistics**

<table>
<thead>
<tr>
<th>Category</th>
<th>1983</th>
<th>1984</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Batters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall SPA</td>
<td>.558</td>
<td>.503</td>
<td>-.055</td>
</tr>
<tr>
<td>Big Ten SPA</td>
<td>.492</td>
<td>.423</td>
<td>-.069</td>
</tr>
<tr>
<td><strong>Pitchers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall ERA</td>
<td>5.15</td>
<td>4.85</td>
<td>-0.30</td>
</tr>
<tr>
<td>Big Ten ERA</td>
<td>8.10</td>
<td>5.29</td>
<td>-2.81</td>
</tr>
<tr>
<td>Overall EHA</td>
<td>9.62</td>
<td>8.55</td>
<td>-1.07</td>
</tr>
<tr>
<td>Big Ten EHA</td>
<td>12.49</td>
<td>9.27</td>
<td>-3.22</td>
</tr>
<tr>
<td>Overall K/W</td>
<td>1.18</td>
<td>1.37</td>
<td>+0.19</td>
</tr>
<tr>
<td>Big Ten K/W</td>
<td>0.78</td>
<td>1.57</td>
<td>+0.79</td>
</tr>
</tbody>
</table>
batting (SPA) were in the expected direction, and the related-samples t-tests were nonsignificant.

**Pitching Performance**

Examination of Earned Run Averages (ERAs) for the group of participating pitchers who competed in both seasons revealed that their 1984 ERAs were slightly lower overall (0.17 runs per game) than the 1983 figures (see Table 3). In addition, there was a sharp decrease in ERA figures for the 1983 to 1984 conference seasons (7.98 to 4.92). Again, design limitations prevented t-tests from being carried out due to the small number of participants (five), the unequal contribution of the pitchers (e.g. 0 to 27.67 innings pitched in the Big Ten), and the behavior of small contributions (e.g. one player pitched two thirds of one inning, surrendered four runs, and subsequently had a Big Ten ERA of 54). Nonetheless, it is noteworthy that yielding three fewer runs each game is of tremendous practical significance, and represents a 38% decrease per conference game.

Table 3 reveals that the change in Earned Hit Average (EHA) for the group of pitchers participating in 1983 and 1984 was nearly the same over all games (down 0.08 hits per game), but plummeted exactly 3 hits per contest in the posttreatment Big Ten season. The ratio of strike outs to walks increased for the group in 1984 for the entire season (+ 0.28), and especially in the Big Ten season (+ 0.84).
The latter indicates that the pitching group struck out nearly one more player than it had in 1983 for every walk given up, thus moving its ratio from the "unacceptable" (0.69 K/W) to the "more than acceptable" (1.53 K/W) range. All of these changes in pitching, as was the case with ERA, are in the desired and predicted direction, and are without statistical evaluation.

Inspection of Table 4 indicates that the data for the entire pitching staff closely resemble that of the group already examined. ERA was slightly lower (down 0.30) in the posttreatment season, and much lower (down 2.81 runs per game) in the conference portion of the 1984 season. The latter represents a 35% decrease (8.10 to 5.29). EHA for this sample was reduced by 1.07 hits each game overall, and 3.22 hits per contest in the conference. In addition, there was a 0.19 increase in the overall K/W ratio, with a 0.79 increase in Big Ten play.

**Won-Loss Records**

Team won-loss records for the entire season, conference schedule, and common opponents are presented in Table 5. As Table 5 indicates, improvements were realized in each of these categories. Losing records against conference opponents and common opponents were eliminated, and the slightly above .500 overall record in 1983 improved to a .635 winning percentage. The 8-8 Big Ten record moved the team from fifth (1983) to third place (1984) in the
Table 5  

**Won-Loss-(Tie) Record**

<table>
<thead>
<tr>
<th>Category</th>
<th>1983</th>
<th>1984</th>
<th>Change^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall record</td>
<td>24-21 (.533)</td>
<td>30-17-1 (.635)</td>
<td>+19</td>
</tr>
<tr>
<td>Big Ten record</td>
<td>3-9 (.250)</td>
<td>8-8 (.500)</td>
<td>+100</td>
</tr>
<tr>
<td>Common opponents</td>
<td>16-17 (.485)</td>
<td>25-11-1 (.689)</td>
<td>+42</td>
</tr>
</tbody>
</table>

^a Change = the percent change in the winning percentage.
East Division, just one half game short of the conference playoffs. There were 19% (overall), 100% (Big Ten), and 42% (common opponents) increases in the team's winning percentages.

The team had a 5-3 record in the two conference series immediately following refresher sessions. Conversely, in the other two series the won-loss record was 3-5.

**Self-Report Data**

Approximately three weeks after the last game of the season, players were sent questionnaires to determine their evaluation of and comments on the program (Appendix C). The first 11 questions were responded to on a seven-point, Likert-type scale ranging from strongly disagree to strongly agree (see Table 6). Questions were worded such that support for the program would be reflected by answers in the agreement end of the scales. The last 5 questions were open-ended, requiring a written response.

Of the 21 questionnaires sent out with self-addressed, stamped envelopes, 13 (62%) were returned. Of the 13 returned, 11 were from batters. Unfortunately, several of the pitchers already may have left to play summer baseball when the questionnaires reached their address, and because only 2 were received from the pitching staff, there was no attempt to separate the evaluations into two groups.

A summary of the questionnaire results is presented in Table 6. In general, most responses to each of the 11
### Table 6

**Questionnaire Results (Responses to 1 - 11 in Percents)**

<table>
<thead>
<tr>
<th>Question</th>
<th>SD</th>
<th>DA</th>
<th>LD</th>
<th>NE</th>
<th>LA</th>
<th>AG</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Relaxed in sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31</td>
<td>69</td>
<td></td>
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<tr>
<td>2. Good image in sessions</td>
<td>15</td>
<td>15</td>
<td>62</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3. Used CCR in games</td>
<td>8</td>
<td>8</td>
<td>23</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4. CCR effective in games</td>
<td>33</td>
<td>17</td>
<td>50</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>5. Used RR in games</td>
<td>23</td>
<td>8</td>
<td>8</td>
<td>46</td>
<td>15</td>
<td></td>
<td></td>
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<tr>
<td>6. RR effective in games</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>50</td>
<td>17</td>
<td>8</td>
<td></td>
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<tr>
<td>7. Relax improved b/p</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td>54</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>8. Imagery improved b/p</td>
<td>8</td>
<td>15</td>
<td>15</td>
<td>23</td>
<td></td>
<td>39</td>
<td></td>
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<tr>
<td>9. Program improved b/p</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>39</td>
<td>31</td>
<td>8</td>
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<td>10. More relaxed overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td>31</td>
<td>39</td>
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<td>11. Will use in future</td>
<td></td>
<td>8</td>
<td>62</td>
<td>15</td>
<td>15</td>
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<td></td>
</tr>
</tbody>
</table>

**Note.** SD = strongly disagree; DA = disagree; LD = slightly disagree; NE = neutral; LA = slightly agree; AG = agree; and SA = strongly agree. Batting or pitching = b/p. One player did not respond to Questions 4 and 6.
questions were in the "slightly agree" to "agree" range, affording at least moderate support to the program. Open-ended Questions 12 and 13 revealed that this sample of players practiced the procedures an average of nearly three times each week (M = 2.81, SD = 1.41) during the preseason, and about twice per week (M = 2.12, SD = 1.50) during the season. Of the 13 responding, 8 (62%) made use of the cassette tape, and 11 (85%) found the refresher sessions helpful (Questions 14 and 15). The last question solicited feedback on ways the program might have been helpful to each player. Those comments will be reported along with remarks made during the program (and season), and the more specific results of questions 1 through 11.

There was strong agreement (69%, with the remaining 31% agreeing) that players could get relaxed in sessions (Question 1). This was evident in that some of the players fell asleep early in the program, and statements emphasizing relaxed attentiveness had to be inserted into the sessions. Also, participants were reluctant to get up after the conclusion of the session. One player reported, "...(I) felt very relaxed during the sessions, and this may have helped my performance." They seemed to enjoy the relaxation, and one individual said that it gave him the opportunity to clear his mind. Most (39%) of the players agreed with Question 10 that they were more relaxed overall as a result of the program (31% slightly agreed). Finally,
a majority (54%) slightly agreed that the relaxation skills they had learned helped them to improve their batting or pitching (Question 7), with 23% indicating slight disagreement. While one person stated that, "This program really helped me relax and cool anxiety in pressure situations," another stated that the program was not very helpful because he had previously considered his ability to relax under pressure to be a strong attribute. Thus, the players reported being able to get relaxed in the sessions and overall, and some believed that the relaxation helped them improve in baseball.

Generally, most agreed with Questions 3 and 4 that they used CCR in games (46%), and that it was effective in helping them to relax (50%). One player commented, "In a high pressure situation, I would use it at the plate: it helped...it helps in tough situations hitting with men on base in the last inning, etc." Another player, who had hit a home run in the last inning to turn an apparent loss into victory, indicated that he had used the cue word.

Most of players only slightly agreed on Questions 5 and 6 that they used Recall Relaxation (RR) in games (46%; 23% disagreed) and that it was effective (50%). Many reported that they liked the recall strategy better than PMR, and that it was even more relaxing as they got better at it. One player responded to the RR by saying, "...(it is the) most relaxed I've ever been." Two of the pitchers
found it especially useful for their arms. Thus, it appears RR may have been an effective substitute for the PMR in carrying out the treatment procedures, but was not as useful as CCR in games. The recall strategy may be superior, however, in relaxing specific muscle groups.

Responses to Question 2 indicate that a majority of the participants (62%) were able to produce an effective image of themselves in the sessions. There also were reports of imagery ability improving with time. Many players commented that there was too much imagery in the sessions, and that they found themselves restless and having a hard time concentrating the last few minutes of the sessions. Players each had their own visualization process, hopefully within the bounds that were presented. About 3 to 5 pitches per minute of imagery seemed to be the norm, although one individual reported as many as 10. Some pitchers visualized their "pick-off move" between pitches, and some batters reported being able to see the seams and spin on the ball. While 39% did agree that imagery helped them to improve their batting or pitching, other responses ranged from disagreement to slight agreement. One player said that the imagery did no good, and another (possibly the same one) stated that he did not even practice the visualization process. Hence, although the imagery seemed somewhat prolonged in the sessions, high quality images were reported. In addition and as with relaxation, there
were differing opinions on how helpful imagery was in improving performance, although most agreed that it had helped.

Most players slightly agreed (39%) while 31% agreed that overall the program was effective in helping them to improve their batting or pitching (Question 9). One player who identified himself on the questionnaire said, "I think the relaxation program improved every part of my game."

This report is particularly interesting in that his SPA increased only slightly overall, and was actually lower in 1984 in conference games. Another player reported having the "...worst season of my career."

Players slightly agreed (62%) on Question 11 that they would use these procedures/skills in the future (30% agreed or strongly agreed). One person said, "The idea of relaxation and concentrating on it helped me with baseball and life in general."

Another added, "It helped me relax not only in baseball but also in my schoolwork (before an exam). By being more relaxed I think I felt more confident." There were many reports of the use and effectiveness of the relaxation procedures to eliminate exam tension.

Finally, there was a significant positive correlation (r = .52; p < .05, one-tailed with 11 degrees of freedom) between the average number of times players practiced the procedures each week (derived by averaging the preseason
and season averages), and how effective they thought the program was (overall) in helping them to improve their performance.

All of the questionnaire data presented should be viewed with caution, given the relatively low return rate, the large percentage of respondents who were batters, and the self-report nature of the information.
DISCUSSION

Summary of the Findings

Based on the results presented in the previous section, all hypotheses stating that batters would improve in performance from the 1983 to 1984 seasons had to be rejected. Pitchers, on the other hand, demonstrated improved performance on all three measures as an entire staff, and as a pretest-posttest treatment group for only the Big Ten season. In addition, the team realized improved overall, conference, and common opponents won-loss records. Clearly, however, the design of the study only permits speculation that improvements may have resulted from the treatment intervention per se.

As previously noted, there was no indication of an increase in the Successful Performance Average (SPA) for the pretest-posttest batters for either the overall or conference seasons. What is intriguing is that the survey data indicated that the players believed that they could become relaxed in sessions, were more relaxed overall, and could effectively use CCR to relax in games. Thus, the self-report measure suggests lower trait anxiety, and lower state anxiety among participants. It is not uncommon to
find relaxation seemingly effective, yet discover that performance does not subsequently change (e.g. Griffiths et al. [1981], Russell & Lent [1982], Russell et al. [1976]).

However, players also believed to an extent that their performance had improved as a result of the relaxation, imagery, and overall program. One player with a performance decrement in conference play, and only a slight increase overall, thought that every aspect of his game improved. In addition, it was noted that the team improved its winning percentage from .533 to .635, a increase of high practical significance in baseball. The seemingly short interval from .500 to .600 separates the average baseball teams from the excellent ones. Thus, an improved team with players who reported that they had improved, calls into question the validity of the SPA batting statistic. It is possible that the SPA does not capture one of the most beneficial effects of the program. As one player commented and another demonstrated with a game-winning home run, CCR was most helpful in high pressure situations. Thus, perhaps it is "...under the most extreme conditions of competition..." as Lane (1980, p. 316) suggests, that these skills become most useful. Improved performance in critical situations may not significantly change the batters' overall averages, but certainly would be reflected in the team's won-loss record, as is the case in this investigation.
Pitchers, as noted, allowed 2.81 fewer earned runs per conference game in 1984 (3.06 for the pretest-posttest group). The 1984 Big Ten staff ERA of 5.29 is far more respectable than 8.10 in 1983. Curtailing the opponents' earned run production by 35% has a tremendous influence upon a team's winning percentage, and is certainly of practical significance in baseball. For example, had the staff given up 3 additional runs in each 1984 conference game, its record would have slipped from 8-8 to 2-12 with 2 ties. It seems reasonable that the large improvement in the team's conference record from 3-9 to 8-8, and the subsequent higher finish (fifth to third) in the division might be a function of the lower ERAs, and increased hitting efficiency under pressure.

It is believed that the lower Big Ten ERA's and strike-out-to-walk ratios account for the lower ERAs. Surrendering fewer hits per game and increasing the number of strike outs per walk lower the number of base runners who have the opportunity to score and the number of run-producing at bats. In this investigation, pitchers allowed three less hits per game and had about one additional strike out for every walk relinquished. Again, these are practically significant changes in baseball. Furthermore, these two ERA-determining statistics are largely a function of the pitchers' "control" over the pitch. It is speculated that the PMR, CCR, and imagery
program may have served to help pitchers improve or maintain control, especially in pressure situations.

There are at least two reasons why the pitching staff might have derived greater benefit from the program than their batting counterparts. First, the 1984 pitching staff was rather young and consequently inexperienced, with many freshmen receiving significant playing time. It seems that younger players would generally be less-skilled, and more susceptible to game pressure. Thus, they might find the relaxation and imagery program most useful. It would have been interesting to receive a more representative number of questionnaires back from the pitchers, since they were the group that experienced the most obvious gains in performance. Second, although baseball was previously classified as an open-skill sport, closer examination reveals that pitching is more of a closed-skill component of baseball. Unlike the batter, the pitcher is essentially dealing with a constant environment during the pitch. The batter must react to the pitch. It has already been mentioned that imagery appears to be more amenable to closed-skill sports (Feltz & Landers, 1983; Highlen & Bennett, 1979; Highlen & Bennett, 1983) or closed-skill components of open-skill sports.

In addition to large improvements in the overall and conference won-loss records, the team greatly improved its 1984 record against teams it had met in 1983. The
elevation from 16-17 to 25-11 with 1 tie could be in part due to the effects of the treatment program.

It is probable that the PMR, CCR, and imagery program was not equally beneficial to all players, just as it may not have been equally useful to batters and pitchers, or in all situations (i.e. more useful under pressure). Twenty-three percent of the survey respondents did not think that they improved from the relaxation or imagery. However, a large majority of the players reported being able to bring on relaxation and produce a good image, partially ruling out skill deficits. There are at least two possible explanations as to why some players may not have found the program useful. First, as previously noted, at least one player felt that he had already been able to relax under pressure. Thus, not all players may have found the relaxation portion of the program useful, in that they were already typically in the optimal performance range of the inverted-U shaped curve of anxiety. Second, some players undoubtedly invested less time than recommended when it came to practicing these techniques. Respondents reported rehearsing the procedures on their own about three times each week prior to the season, and approximately twice per week during the season. These averages are about half of what was recommended, and there was considerable variability around the means. Furthermore, as noted, there was a significant positive correlation between the number
of weekly practices, and the belief that the overall program helped the player to improve his batting or pitching. It is possible that players who devoted more time to these techniques derived greater benefit. It is also conceivable that those who derived greater benefit invested more time, or that investing more time led people to believe that they must have been improving.

A majority of the players reported being able to effectively use CCR in games, thus supporting its efficacy as a treatment strategy. Recall Relaxation (RR) was an efficient PMR replacement, but with the possible exception of specific muscle tension (i.e. the pitcher’s arm), it was generally not used as often or viewed as effective as CCR in games. Other questionnaire results of interest included the apparent generalization of these skills (especially CCR) to other tasks such as test-taking, and the intention of many players to use these procedures/skills in the future. Recommendations for future programs, inferred from player responses, included the continued incorporation of refresher sessions and distribution of the cassette tapes, as well as the reduction of imagery time in the sessions. The refresher sessions, as noted, were followed by more successful conference performances, and while that might support the efficacy of this program, it might also have influenced their perceived value. As for shortening the number of imagery trials (the 60 seconds per trial seemed
acceptable), it is unsure how that would interact with imagery's effectiveness. In addition to these recommendations, it would be useful to assess early in the program how beneficial the relaxation training might be to individual participants, and perhaps later incorporate a more thorough check on players' visualization skills.

**Limitations**

Thus, (a) reported lowering of trait anxiety and (b) reported greater control over state anxiety, (c) meaningfully improved pitching in the conference, (d) greatly improved team won-loss records, and perhaps (e) superior performance under pressure could have all been benefits of the PMR, CCR, and imagery program for the team sport of baseball. However, there are several reasons why the conclusions of this study must be reduced to speculations. First, the absence of a control group to "control" for maturational and other such effects essentially makes this investigation a group case study. Second, small sample sizes and the nature of the data precluded certain statistical analyses. Third, various comparisons which were made involved the assumptions that the OSU teams of the pre- and posttreatment seasons, as well as the opposing teams, were reasonably well-matched. Finally, the questionnaire data have to be viewed with caution due to the 62% return rate, and possible demand characteristics and other difficulties that may arise with
self-reported information.

**Directions for Future Research**

Unfortunately, as is the case in this investigation, control must often be sacrificed in order to be better able to generalize research findings to real-world situations. However, studies with greater control are needed, especially ones which would enhance generalization. In addition, component-analysis research seems to be an essential step in isolating the effective portions of a program such as this, and analyses which examine the various explanations for the effectiveness must be conducted.

Future research also needs to consider the conditions under which the various treatment techniques are most effective. It seems that effectiveness may be moderated by the sport, task, situation, individual, ability level, trait anxiety, and so forth. Furthermore, there may be preferential methods of treatment administration, depending on the aforementioned variables. Finally, some guidelines should be established to govern the administration of treatment techniques such as imagery, in order to facilitate the comparison of findings.
FOOTNOTES

1. The Big Ten conference is divided into two five-team divisions. OSU plays a four-game home series against each of two of its divisional foes, and plays the other two on the road. The top two teams from each division (decided by the 16-game record) are sent to a postseason tournament to decide the Big Ten championship and the NCAA berth.
APPENDIXES
Appendix A

Muscle Groups in Order of Presentation

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

Appendix B

Progressive Muscle Relaxation Handout

PROGRESSIVE MUSCLE RELAXATION

Key Points

1. It's a skill and therefore it takes 20-30 minutes (even less as you become more skilled) of practice each day in a quiet, relaxing setting to become effective. Many athletes find it most convenient and helpful to practice each night before falling asleep. It should become refreshing.

2. It is both mental and physical. Your concentration will inevitably waver and you will just need to refocus when that happens.

3. Each muscle group is tensed and subsequently relaxed twice before moving to the next group. Periods of tension should last 8-10 seconds, and relaxation should last about 30 seconds. Tension should be firm, but be careful not to create cramps, etc. Relax immediately if any muscle starts to cramp.

Muscle Groups

1. right hand and forearm
2. right upper arm (biceps and triceps)
3. left hand and forearm
4. left upper arm
5. face 1 (forehead)
6. face 2 (eyes and nose)
7. face 3 (mouth and jaw)
8. neck (front and back)
9. shoulders, chest, upper back
10. abdomen
11. right thigh
12. right calf
13. right foot
14. left thigh
15. left calf
16. left foot

How To Accomplish

1. fist
2. elbow into side
3. fist
4. elbow into side
5. squint hard and wrinkle nose
6. clench teeth and force lips back
7. counterpose (head will shake)
or push head back
8. or raise shoulders (turtle)
deep breath and shoulder blades back (pressure both ways)
tighten stomach up as if to hit self
tighten against itself
or raise leg a few inches
toe up
curl toes down and point inward
tighten against itself
or raise leg a few inches
toe up
curl toes down and point inward
Appendix C

Questionnaire

One final task. Would you please take a couple of minutes to fill out this quick survey; stick it in the enclosed, addressed, stamped envelope; and drop it in the mail ASAP? It should only take you a few minutes to anonymously respond to these statements/questions, and this final piece of information is extremely important to the thesis. My thesis will be available for you to see at the end of the summer.

I have really enjoyed working with you, and had even more fun watching you play. I could not have asked for more cooperation from players and coaches. Thanks for your work and good luck on finals and whatever else lies ahead. And most of all, congratulations on a fine season. Un

RESPOND BY CIRCLING THE APPROPRIATE NUMBER (higher numbers = higher degree of agreement)

1. I could become very relaxed in the group sessions.

1-2-3-4-5-6-7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY AGREE

Comments:

2. I could produce a good image of myself during the visualization part of the sessions.

1-2-3-4-5-6-7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY AGREE

Comments:

3. I used cue-controlled relaxation ("calm") in games to become more relaxed.

1-2-3-4-5-6-7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY AGREE

Comments:

4. Cue-controlled relaxation was effective in helping me to relax in games.

1-2-3-4-5-6-7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY AGREE

Comments:

5. I used recall relaxation (recalling the feelings of relaxation in the arms, etc.) in games to become more relaxed.

1-2-3-4-5-6-7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY AGREE

Comments:
6. Recall relaxation was effective in helping me to relax in games.

1---------2---------3---------4---------5---------6---------7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY
DISAGREE DISAGREE AGREE AGREE

Comments:

7. I believe that the relaxation skills that I learned were effective in helping me to improve my batting.

1---------2---------3---------4---------5---------6---------7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY
DISAGREE DISAGREE AGREE AGREE

Comments:

8. I believe the imagery was effective in helping me to improve my batting.

1---------2---------3---------4---------5---------6---------7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY
DISAGREE DISAGREE AGREE AGREE

Comments:

9. Overall, I think the program was effective in helping me to improve my batting.

1---------2---------3---------4---------5---------6---------7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY
DISAGREE DISAGREE AGREE AGREE

Comments:

10. I think that I felt more relaxed overall as a result of the program.

1---------2---------3---------4---------5---------6---------7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY
DISAGREE DISAGREE AGREE AGREE

Comments:

11. I will use these procedures/skills in the future.

1---------2---------3---------4---------5---------6---------7
STRONGLY DISAGREE SLIGHTLY NEUTRAL SLIGHTLY AGREE STRONGLY
DISAGREE DISAGREE AGREE AGREE

Comments:

12. During the pre-season I practiced the procedures an average of ______ times per week.

13. During the season I practiced the procedures an average of ______ times per week.

14. Did you use the tape? ______

15. Were the refresher sessions during the season helpful? ______

16. Please comment on how this program was most helpful to you. Did you use these procedures/skills in areas of your life other than baseball?
LIST OF REFERENCES


