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Effects of imagery rehearsal perspective on the performance of a perceptual-motor skill

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EFFECTS OF IMAGERY REHEARSAL PERSPECTIVE ON THE PERFORMANCE OF A PERCEPTUAL-MOTOR SKILL

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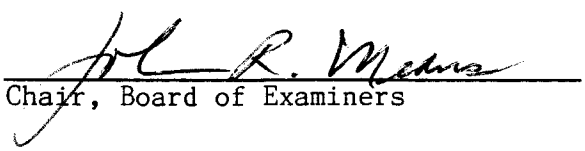

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The purpose of this study was to examine the possible differential effects of imagery rehearsal perspective (internal-external) on the mental practice and subsequent physical performance of a precision, "closed", perceptual-motor skill, dart-throwing. Twenty-four male and 24 female university students were randomly assigned into three equal treatment groups: (a) external imagery rehearsal (EIR), (b) internal imagery rehearsal (IIR), (c) relaxation/attention-placebo control (RAPC). Anxiety (Sport Competition Anxiety Test), locus-of-control, previous experience, and imagery style measures were taken prior to the baseline performance assessment.

The design was a 3 (Treatment Condition) X 2 (Sex of Athlete) X 2 (Trials) factorial design.

Treatment for the imagery groups consisted of five imagery rehearsal sessions with pre- and post-imagery rehearsal physical practice periods conducted over the course of one week, and was followed by a post-treatment performance assessment session. The relaxation/attention-placebo group received (concurrent with the other groups) five audio-relaxation sessions (audiocassettes of relaxing environmental sounds) with physical practice periods. Daily manipulation checks were taken in all conditions. Pre- to post-treatment changes were assessed as well as changes in imagery ability and usage.

Results indicate that both imagery rehearsal groups improved significantly pre- to post-treatment, while the RAPC did not; however, post-treatment performance levels for the three groups were not significantly different. Men performed at a level significantly higher than women at baseline and post-treatment assessment. The hypothesis that internal imagery would enhance performance to a greater extent than would the EIR or RAPC conditions was not supported.

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CHAPTER I

INTRODUCTION AND HISTORICAL CONTEXT

James Michener pointed out in his 1976 bestseller Sports in America that competitive sport is and will continue to be a pervasive aspect of contemporary American culture. Hosting the 1984 Olympics in Los Angeles has fanned (so to speak) the flames of domestic enthusiasm for athletics at every level of involvement and has set the stage for a major resurgence in sports participation. During the hundreds of hours of Olympic television coverage the American people -many for the first time- were exposed to and given examples of sport psychological techniques, e.g., Dwight Stones, the American outdoor record holder in the high jump, used a form of skill imagery rehearsal prior to every jump. Now many athletes, coaches, and parents of athletes are aware of the existence of a branch of psychology specifically devoted to the improvement of the mental side of athletic performance. For many years prior to the 1984 Olympics, many outstanding athletes had been cognizant of the impact that psychological processes had on their athletic performance, and their reportage (Bannister, 1955; Fosbury, 1974; Russell,1979), along with other factors, has significantly increased the need for sport psychological services (Mahoney, 1979).

For these and other important reasons, e.g., extending the known limits of human performance, the study of the psychology of sport has emerged as the bright new star in the firmament of the cognitive-behavioral sciences.

Though still an incipient science there have been significant strides made in the understanding and modification of certain psychological processes that impact on an athlete's sport performance. The successful use of imagery rehearsal (IR) by athletes in a variety of sports disciplines is an excellent illustration of how the application of sound psychological principles has communicated to the athletic community the enormous potential of this hitherto little recognized and poorly understood field.

The focus of this study will be on imagery rehearsal as a psychological performance-preparation technique for athletic competition. More specifically, the perspective or "orientation" of the imaginal rehearser will be investigated with respect to subsequent achievement on a ballistic performance-outcome measure. Mental imagery (the precursor of imagery rehearsal) as it pertains to mental practice of a skill, was first discussed in the literature as early as 1934 (Sackett, 1934). Since then there have been over one hundred studies conducted in the area of mental practice with the vast majority involving mental imagery in one form or another. A recent meta-analysis of this body of research (Feltz and Landers, 1983) as well as review articles (Silva, 1983; Suinn, 1983; Weinberg, 1981) have done much to point out the methodological inadequacies and theoretical inconsistencies that pervade much of the mental practice research conducted up to the present time. Feltz and Landers (1983) summarize the major findings of their extensive meta-analysis in four basic propositions and go on to make design and methodology recommendations for future research in the area. The present study seeks to incorporate their methodological recommendations (in addition to those of Suinn,

1983) in an effort to shed new light on a question that has puzzled researchers in the mental practice area since the early 1900's.

When you ask an athlete to imagine herself performing a sports skill, will she imagine the movement/skill from a first- or third-person perspective (Mahoney and Avener, 1977)? Mahoney and Avener (1977) dichotomized the kinesthetic and visual images reported by elite gymnasts into an "internal-external" classification system premised on the orientation of a performer's imaginal perceptions during image generation. The authors defined the "internal-external" dichotomy as follows:

> "This distinction refers to the perspective of the imagery. In external imagery, a person views himself from the perspective of an external observer (much like in home movies). Internal imagery on the other hand, requires an approximation of the real-life phenomenonology such that the person actually imagines being inside his/her body and experiencing those sensations which might be expected in the actual situation." (p.137)

Which of these imagery "orientations" (if either) when applied to the mental rehearsal of a sport skill will subsequently yield the greater performance enhancement? Equivocal findings have left this question unresolved and it was the intent of this study to shed new light on this research issue.

Before reviewing the literature pertinent to this question several terms need to be defined, and this entails clarifying the use of the expressions "mental practice,""mental rehearsal," "covert rehearsal," and "imagery rehearsal." Mental practice (MP) has been defined by Richardson (1967a, p.95) as "the symbolic rehearsal of a physical activity in the absence of any gross muscular movements." Corbin (1972, p.94) expanded this definition of mental practice by including that it is the "...repetition of a task, without observable movement, with the specific intent of learning." This generic term, i.e., mental practice, has been applied to a wide assortment of non-physical practice techniques: (a) reading a description of a sport skill, (b) memorization of a description of a skill with recall at given intervals, (c) viewing film or videotape demonstrations of correct skill performance, (d) having a skill description read to the subject, (e) imagining the correct execution of the skill, (f) introspectively conceptualizing the skill, and (g) visuo-motorically reexperiencing the actual, physical performance of a sports skill. The meanings of the terms "mental practice" and "mental rehearsal" connote too much to precisely define the nature of the treatment in this study. Silva (1983, p.253) defined "covert rehearsal" as "...imagined, symbolic rehearsal of an activity. This covert rehearsal may be manifested as covert subvocalizations, visual display, or kinesthetic-visual stimulation." Suinn (1983, p.509-512), continuing in this same vein stated that imagery rehearsal is (vis-a-vis mental practice) "...a more narrow term used here to mean covert practice where imagery is the dominant experience (used) to achieve the rehearsal." Suinn expands his definition of imagery rehearsal (for which he coined the term

"visuo-motor behavioral rehearsal" (VMBR)) to include evidence of affective, motoric, and physiological involvement, and to be conceived of as imagery training where control of the experience is gradually learned. In differentiating his VMBR program from standard imagery rehearsal (Suinn, 1976, p.41) he maintains that VMBR is

> more than sheer imagination. It is a well-controlled copy of experience, a sort of body-thinking-- similar to the powerful illusion of certain dreams...the major difference between such dreams and VMBR is that the imagery rehearsal is subject to conscious control (Suinn, 1983, p. 41)

In the context of this study imagery rehearsal is defined as the non-physical multi-modal (affective, kinesthetic, cognitive) covert rehearsal of a sport skill utilizing imagery as the predominant rehearsal vehicle with the specific intent of enhancing and improving the subsequent performance of the skill. With our terms defined we can now better assess the genesis of mental practice as a performance enhancement cum psychological preparation technique. The literature review to follow will: (a) examine early and contemporary research in the area of mental practice, (b) discuss the methodological inadequacies inherent in much of the research, (c) discuss relevant IR theories, (d) examine previous IR perspective studies highlighting the "internal-external" controversy, and (e) examine how this study was an improvement over past research in this specific area.

Early Imagery Investigations

Perhaps the earliest reference to imagery rehearsal as a potential means of learning a sport skill is Anderson (1899). Anderson (1899) speculated that gymnastics skills might be learned via "thought" rather than through actual overt physical practice, i.e., train the mind to perform the skill without involving the use of any physical movement. Though his ideas were not subjected to experimental investigation at that time, many researchers have subsequently investigated and in several cases substantiated his original notion of skills acquisition through imagery rehearsal.

In a contemporary and related line of inquiry James (1890 a,b) and later, Carpenter (1894), speculated that powerful thoughts can find expression in the muscles. James' (1890b) ideomotor mechanism theory was premised on the notion that cognitions and images can premediate a response, i.e., thoughts mediate behavior. Carpenter (1894) first postulated an "ideomotor principle." This principle posits that any idea that can dominate the mind finds expression in the related musculature, i.e., tentative movements. Washburn (1916) took the speculations of James and Carpenter a step further and posited that indeed muscular movements of slight magnitude do occur when an individual imagines him/herself performing a task and she maintained that minute movements are identical to those produced by the physical performance of the activity except that they are of a lesser magnitude. She speculated that centrally excited sensations (mental) have less impact (are less steady and enduring) than peripherally excited

sensations. It may be inferred from her writings that both peripheral and centrally excited sensations can affect certain changes in performance and that peripheral excitation is of greater value in affecting change in skilled performance. These pioneering thinkers laid the initial cornerstones for later research that sought to link covert processes to overt behavior.

Over fifty years ago Jacobson (1930, 1931, 1932) conducted the first empirical investigations into the relationship between imagery modality and concomitant muscular response. His studies lent credence to the "ideomotor principle" and further specified that "visualization" of a weight-lifting task produced predominantly ocular muscle EMG responses (increased action potentials) and that "imagination" of the same task produced a preponderance of EMG activity in the biceps. As Hale (1982) points out,

> Although sophisticated EMG instrumentation and statistical inference were unavailable, the results (Jacobson, 1932) suggested that the predominant modality/perspective of the image seemed to be a crucial variable in determining the location of the concomitant afferent response (Hale, 1982, p. 380).

So we can see that even as early as 1932 the questions of perspective and modality of the image aare already puzzling psychologists. In a related field of interest Jacobson gained considerable notoriety for his "Progressive Relaxation Procedure" (1938). He demonstrated that this procedure can induce relaxation, reduce arousal/anxiety levels, and

permit greater saliency of imagery. His imagery/EMG work comprises the foundation of what is now commonly called the "neuromuscular feedback theory" Richardson (1967a).

It is noteworthy that Freeman (1931) also reported that mental activity is accompanied by variations in muscle tensions. He reported that "photographic registration of the thickening of several muscle groups provided valid and important evidence of the spread of neuromuscular activity during mental work;" (cited in Start, 1960). This study would appear to support Washburn's (1916) contention that minute muscular contractions accompany mental activity. Research in the field up to this time had addressed itself primarily to the relationship between mental activity and concomitant muscular activity. The first empirical research directly examining the differential effects of physical and mental practice on performance was conducted by Sackett (1934, 1935).

Sackett (1934,1935) employed "ideational or symbolic" activities in his research which emphasized the symbolic rather than the motor elements of the performance task. These "symbolic activities" which included such tasks as mirror-drawing, maze-tracing, and card-sorting did incorporate some precision motor involvement, but obviously emphasized the more cognitive-symbolic aspects of performance. Sackett found that physical practice (PP) was superior to mental practice (MP) in facilitating skill performance subsequent to a training and practice period, and although he noted that MP was valuable in both the performance and retention aspects of the skill he felt that it was more

effective in improving the perceptual-motor skills than it was for skills with a greater proportion of pure motor elements.

Shaw (1938) in investigating the question of localization of minute muscular innervations during "imagined activity" produced results contrary to those of Jacobson (1932,1938). Shaw did not find localization of increased action potential activity. In a later study, Shaw (1941) found a linear relationship between involuntary muscle activity and the "weight" of the weight being lifted in imagination with the muscle activity increasing in direct proportion to the increase in "imagined" poundage.

(Author's Note: It is interesting to note that mental practice, per se, went through an extended period of "pop"-ularization in the print media beginning in the late 1930's with "Imaginary Practice" in Newsweek (Shaw, 1939). This period of incipient sport psychology also saw mental practice-related articles appear on such diverse topics as chess (Phillips, 1955) in Reader's Digest; books on mental practice and its value in improving golf skills (Morrison, 1932, 1949) "A New and Better Way to Better Golf" (1932) and "Better Golf Without Practice" (1940); and of interest, is a book describing the exploits of a "team psychologist" with the St. Louis Browns (Tracy, 1951), "Psychologist at Bat.")

The 1930's continued to be (relatively speaking) a productive time in field of mental practice as researchers began to refine the mental practice paradigm. Illustrative of this trend is Eggleston (1936) who conducted a study much like Sackett (1934) with PP, MP, and no practice (NP) conditions. Using card-sorting and digit-substitution tasks he

examined the relative values of MP and PP and found that both groups improved significantly over the NP condition with respect to both ideational and sensory-motor learning. Physical (actual) practice was again reported as being slightly superior to mental (imaginary) practice, but MP was seen as an effective method and important adjunct in learning new skills.

Perry (1939) conducted a study designed to investigate the relative effectiveness of MP and PP in the acquisition of five tasks differing in relative proportions of cognitive and motor elements, but all essentially emphasizing the "ideational" aspects of learning. Yet again PP was reported as facilitating performance to a greater extent than MP, with MP being superior to the NP condition. Perry (1939) characterized MP as an effective tool in the performance enhancement of tasks/skills high in ideational or cognitive elements. Since this study included no "high-end" perceptual-motor task for comparison he could not conclude how MP and PP would differ in their relative effects across the cognitive-motor continuum.

Buxton (1942) in a review of the MP literature suggested that skill acquisition might possibly be an appropriate type of learning situation for studying the effects of MP. Since the studies reviewed were of an "ideational" (cognitive) vis-a-vis motor skill nature it would remain to be seen how MP fared in the perceptual-motor skill domain; stepping in and filling this void in the research were Vandell et al.(1943). This investigation is usually portrayed in the MP literature as a "classic" study due to its groundbreaking use of sport-oriented perceptual-motor skills as performance outcome measures. It is also important for two

other reasons: (1) it examined the relative effectiveness of MP and PP across different skill levels, i.e. junior high, high school, and college-aged males, and (2) they reported their MP times (and procedures) which have subsequently been shown to be excessive in duration. Because the study is fraught with methodological and statistical shortcomings the validity of the conclusions is questionable. Employing dart-throwing and free-throw shooting tasks the authors reported significant improvements for both the MP and PP groups with MP reportedly almost as effective as PP in enhancing motor skill learning. Disregarding the methodological flaws this study is important because it pioneered the use of MP with skilled motor performance and helped establish the area as a viable field of research.

Wilbur Twining (1949) saw the absence of a statistical analysis of the Vandell et al.(1949) data as a major flaw that required independent verification "before a reliable evaluation could be made" (Twining, 1949, p.433). He changed the motor activity task to increase the generalizability of his findings and designed the experiment to allow for a statistical examination of the difference in the learning of a motor skill through mental practice as differentiated from physical practice. He utilized college men and a ring-toss task and found that both PP and MP were effective in facilitating the learning of a simple motor skill. Twining notes that

> Furthermore, introspective comments recorded by subjects during MP indicate that genuine mental effort was effective for only about the first five minutes of each

> practice period. Beyond that concentration became increasingly difficult (Twining, 1949, p. 435).

This suggests one parameter of imagery rehearsal effectiveness, i.e., optimal time spent in MP. Mental practice consisted of actively "mentally picturing" the entire ring-toss procedure. (It is interesting to note that this bias towards "visual" set resulted in an improvement.)

Any date or study chosen as a line of demarcation between "eras" in psychology is probably arbitrary and artificial no matter what the rationale or argument made for its importance. Despite this disclaimer it is interesting to note that Twining's (1949) study appears to mark the end of one era and the dawn of another in the realm of imagery rehearsal/mental practice research. His assiduous attention to statistical analysis and data collection procedures, and his delineation of several primary parameters of MP make this study stand out as a step up from previous inquiries into this area and a step forward into the modern era of imagery rehearsal research.

A major flaw in the early IR research was that most researchers apparently assumed that all subjects were mentally practicing in approximately the same manner. It is important to note that at this point in the genesis of imagery rehearsal, "mental practice" is still relatively undefined. Subjects are being told to: think about, conceptualize, introspectively analyze, visualize, and imagine, various skills with little instruction given by the experimenter with respect to the perspective of the IR, number of trials per session, degree of relaxation, or type of imagery.

During the 1950's and early 1960's enthusiasm for this field of research waned and mental practice received little attention in the literature, perhaps due to its "introspective" nature in a time of burgeoning behaviorism. There were, however, several interesting studies worth noting which are illustrative of the topics being researched in IR during this quiescent period. These areas of inquiry include: combinatory effects of MP and PP, interaction of MP and skill ability (experience) level, optimal time of MP, effect of IR ability on performance, and effect of task type and arousal state on MP.

Trussell (cited in Richardson, 1967a) and Steel (1952, 1962) conducted early studies investigating the effects of MP and PP practiced concomitantly. Utilizing a baseball throw, Steel (1962) and a three-ball, two-hand juggling task (Trussell, 1952) these authors found no significant improvement in skilled motor performance subsequent to MP alone. They did, however, report that MP and PP in concert proved to be an effective practice procedure. Harby (1952) also reported data indicating that a combination of MP and PP was the most effective method of practice. Clark (1960) reported similar findings and went on to report that some degree of PP should be included for a person to optimally benefit from an MP procedure.

Morrisett (1956) (as cited in Corbin, 1972) conducted a study which sought to differentiate the effects of mental practice along the three skill dimensions inherent in any given task, i.e., symbolic (stimulus-response associations), perceptual (stimulus discrimination), and motor (high in skeletal-muscular activity) elements. Morrisett (1956) hypothesized that the performance of any skill requires some

elements of each dimension, but that in any skill one or more of the dimensions predominates, e.g., a bench press would be high in gross motoric content and requiring few symbolic elements. He goes on to postulate that skills high in symbolic content may be more amenable to improvement with MP than tasks in which motor or perceptual elements predominate; his findings support his hypotheses. Morrisett (1956) concludes that MP improved the performance of symbolic/ideational skills the most and had little effect on motor task performance. He did not rule out the possible facilitative effects of MP with motor skills, but did conclude that the effectiveness could be mediated by the proportion of motor to symbolic elements inherent in the task.

Mental imagery research from 1960-on tended to focus essentially on various specific factors that impact on the efficacy of MP. These factors include: (a) subject characteristics, (b) task characteristics, (c) temporal and procedural parameters of IR (imagery rehearsal), and (d) optimal combinations of these factors for specific skills. The remainder of this review will be devoted to the discussion of research that relates specifically to these factors. This will lead into an examination of those studies that have a direct bearing on the development of the "internal-external" question, and this study.

Subject Characteristics

With respect to IR, subject characteristics include: (a) skill level, (b) previous task experience, (c) generalizable "games" ability, (d) imagery ability, (e) natural imagery "style", and (f) motivation effects.

Several studies have been done which apply directly to the question of skill and its relationship to MP. Clark (1960) conducted a study investigating the effects of MP and PP on free-throw shooting. The author utilized three ability groups differing in skill level: varsity, junior varsity, and novice level basketball players and divided them into equal MP and PP conditions. Both conditions showed significant gains in free-throw percentage with the novice and junior varsity subjects exhibiting greater percentage gains relative to the varsity group. In a related line of inquiry, Start (1962) reported data that run contrary to that of Clark (1960). Start (1962) found that subjects rated high in "games ability" utilized MP more effectively than subjects rated poor in "games ability." Whiteley (1962) (cited in Corbin, 1972) reports results that also contradict those of Clark (1960). He reports that subjects with high motor ability outperformed and utilized MP more effectively than subjects of lower motor ability. In support of Clark's (1960) contention is the research of Start (1964b) and Doyle (1968) who both report that motor ability and skill level do not appear involved in the ability to utilize MP effectively. Other studies by Noel (1980) and Smyth (1975) also indicate that the relationship between skill and ability levels, and IR techniques is not a simple linear one. Thus, the direct impact of skill level on MP remains open to question.

Previous task experience appears to be a parameter of IR that has a direct impact on the effective use of MP. Corbin (1967a, 1967b) is widely cited for his research into the question of degree of familiarity with the rehearsed task. Corbin (1967a) utilized a novel performance task (wand juggling) and found no skill improvement in the MP condition. However, Corbin (1967b) found that by allowing subjects controlled

exposure to the task prior to MP he was able to facilitate significant improvement in overt skill performance in the MP condition. Schramm (1967) used an EMG measure and found that MP immediately following exposure to the performance task produced the highest level of muscle activity during IR. Phipps (1968) argued that prerequisite experience with the task may only be of consequence when the skill is complex, and may not necessarily be important to the MP of simple motor skills. Previous experience appears to be an important parameter of IR, and should be a consideration in any study involving mental practice.

Imagery ability is a broad category that includes: (a) controllability, and (b) clarity of imagery. Whiteley (1962) conducted a study designed to test the effect of IR on performance. Despite the fact that the dependent measure for imagery ability appears to be more of a test of memory, he found a correlation of .63 between imagery ability and physical performance of a ball-throwing task subsequent to MP. Start and Richardson (1964) were also interested in the question of imagery ability and the effective use of MP. Their findings suggest that clarity and vividness of the imagery must be considered in combination with the reported controllability of the imagery. Their data indicates that subjects with vivid, controlled imagery benefit that most from MP, followed by non-vivid, but controlled imagery. Uncontrolled non-vivid imagery and uncontrolled vivid imagery were less beneficial in promoting effective use of MP. Smyth (1975) conducted a similar experiment comparing physical practice to duration-limited (unguided) and trials-limited (guided) MP, and found that physical practice enhanced performance the most, followed by duration-limited and trials-limited MP. Gilmore (1972) reports that duration-limited MP, PP,

and trials-limited (controlled) MP/PP are significantly more performance-enhancing than simple trials-limited MP alone or a placebo control in learning a gymnastics skill. The author also makes the interesting observation that women varied very little in their ability to use the five different experimental practice conditions, while the male subjects were most adept at utilizing duration-limited MP and PP.

White, Ashton, and Lewis (1979) in a more contemporary study, found no significant correlation between their MP subjects' total scores on Sheehan's (1967) adaptation of Bett's imagery scale and their performance improvement scores. However, in comparing the effects of MP, PP, and MP/PP on reaction time they found MP/PP to be significantly better than MP or PP alone (though each of these proved significantly better than a no-practice control). They also reported that improvement was significantly related to a subject's ability to use kinesthetic imagery. Ryan and Simons (1981) compared the effects of MP and PP on cognitive and motor tasks and found no significant relationship between vividness or controllability and performance on a motor task, but did find a significant correlation between vividness of imagery and performance on a cognitive task. Ryan and Simons (1983) again found PP to be the superior practice method, and also found a significant correlation between vividness of imagery and improvement on the motor task subsequent to IR. Both strong kinesthetic and vivid visual imagery were associated with improved motor task performance. Another pertinent finding from this study was the fact that the subject's natural "imagery-use style" did not seem to affect the outcome-- all subjects in the IR condition improved significantly more than in the non-imagery condition.

Natural imagery style can be defined or described in several ways: (a) frequency of use of imagery in daily life, (b) clarity of imagery, and (c) perspective of the imagery. Ryan and Simons (1983) note that they expected a balanced ratio of imagers to non-imagers-- this did not prove to be the case. They reported having difficulty finding individuals who did not use imagery at least some of the time. Regardless of the frequency of imagery use in everyday life all subjects in the imagery conditions improved significantly over the non-imagery condition. Clarity of imagery relates to the strength, vividness, and controllability of the imagery. Research in this area has yielded equivocal results and it has yet to be determined if the use of IR techniques by individuals with a non-imagery orientation can yield deleterious effects with respect to performance. IR perspective is also a poorly researched topic that has also yielded equivocal findings. It remains to be determined if there is a relationship between natural imagery perspective and performance, and if the correlational data of Mahoney and Avener (1977) is sport-, athlete-, or skill-ability specific. Future research needs to address itself to the inherent problems of imagery and imagery-style assessment before the question of perspective and performance can be adequately investigated.

The final aspect of subject characteristics to be discussed is motivation and/or expectancy effects. Many authors (Hanson, 1967; Landers and Landers, 1973; Williams, 1970) have talked about the possibility that the effects of IR might simply be due to expectancy effects, i.e., the Hawthorne effect; Weinberg, Seabourne, and Jackson (1981) did something about it. They utilized an attention-placebo control group (in lieu of the traditional no-practice control) in order

to investigate this alternative explanation for the facilitative effects of IR.

An attention-placebo control is an ersatz "treatment" condition that receives a bogus treatment that is sufficiently relevant and believable in content that (a) subjects are motivated to participate, and (b) whatever demand characteristics that may be inherent in the "true" treatment procedure are accounted and controlled for. Andre (1985), in his study of the effects of slow-motion imagery instructions on IR, utilized a biblio-film attention-placebo control group and had the subjects actually express enthusiasm for the material vis a vis a lukewarm reaction from the subjects in the "true" treatment conditions. The research indicates that attention-placebo controls contribute to more meaningful interpretations of the data. They help to more adequately and systematically account for possible demand characteristics and expectancy effects. The present study utilized an audio-relaxation attention-placebo control condition.

Task Characteristics

Historically, there has been a continuing question regarding which task-types might be amenable to improvement using IR. There appear to be several task-type related factors which impact on the effectiveness of IR: (a) perceptual, motor, and cognitive content of the task, and (b) the "closed" vs "open" nature of the task. The early work of Sackett (1934,1935) suggests that MP may prove more effective in improving perceptual-motor tasks, but less so with skills predominantly motor in nature. The research of Siipola (1935), Eggleston (1936),

Perry (1939), Morrisett (1956), and Wrisberg and Ragsdale (1979) all advance the "symbolic learning" theory of Sackett (1934). This hypothesis states that MP should be most effective with tasks high in cognitive content. This "symbolic learning" explanation of MP has recently been reformulated as the "cognitive-motor" hypothesis by Ryan and Simons (1981). This hypothesis restates that the position that MP should be most effective with high cognitive content tasks (as opposed to gross motor skills).

Poulton (1957) first proposed the idea that skills (especially sport skills) could be conceptualized as occurring in environments that span a continuum from "open" to "closed." According to Gentile (1972) an "open" skill is performed in an environment where the spatial aspects are changing at every moment so that it exerts spatial and temporal control over the skill, e.g., basketball. A "closed" skill, on the other hand, is usually performed in an environment where the spatial aspects are static, so that the environment exerts only a spatial control over the skill performance, e.g., darts. Several researchers have suggested that MP may be more effective in improving self-paced (closed) skills. McBride and Rothstein (1979), Highlen and Bennett (1979), and Brumbach (1968) have all conducted research designed to explore the differences in the psychological domains of "open" and "closed" skills. This research suggests that IR may be more effective in "closed" environments. Brumbach (1968) states that with respect to badminton MP was more effective with "restricted or precise" (closed) skills than it was in facilitating the improvement of more "gross and dynamic" (open) movements. This aspect of IR is far from well-researched, but indications are that MP is more effective with

"closed" skills, e.g., gymnastics, than it is with more "open" skills, e.g., volleyball. The present study utilized darts as the performance outcome measure because it was a "closed," self-paced precision motor skill. Though darts is an easily quantified, precision ballistic sport skill that falls left of center on the cognitive-motor continuum, it still contains enough cognitive, affective (self-efficacy), and perceptual-motor element to make it an appropriate performance task for this study.

Temporal and Procedural Design Variables in Imagery Rehearsal

There are several factors that impact on IR that do not fall under the rubric of subject or task characteristics, but instead pertain to temporal and procedural considerations. Corbin (1967a, 1967b, 1972) studied the impact of previous task experience on IR. He reported that previous experience with the skill facilitated the MP and subsequent performance of the skill. It would appear that in order for the perceptual and memory "traces" (Adams, 1971; Hale, 1982; Lang, 1977) to be most easily reexperienced (at their strongest and most salient) there should be some exposure to the task just prior to IR. This study included a brief darts warm-up period (per Hale, 1982) just prior to the start of the five daily IR sessions, as well as a physical practice period following the IR segment of the session.

The enhanced effectiveness of IR with concomitant physical practice has been demonstrated by Corbin (1967b), Egstrom (1964), Harby (1952), Luebke (1967), and Riley and Start (1960). There have been different possible reasons offered as explanations for the enhanced combinatory

effectiveness of interspersing MP and PP periods (Corbin, 1972; Weinberg, 1981). These explanations include: (a) the MP period offers a respite from PP, (b) MP is a time to consolidate newly learned material, (c) MP breaks up the monotony of PP and heads off "motivation loss" (Luebke, 1967), and (d) PP provides a period for implementing possibilities for performance improvement "discovered" in IR (Suinn, 1972). Both Corbin (1972) and Weinberg (1981) report that alternating MP with PP facilitated learning through MP, and for this reason the present study included this PP/MP/PP format.

The length of the IR period, frequency of IR sessions, and quantity of skill trials per IR session are all topics of study in MP research. The question of optimal duration for the IR period has been addressed by Shick (1970), Twining (1949), and in the meta-analysis of Feltz and Landers (1983). The findings of these studies suggest that IR intervals should be between three and five minutes long to be most effective. The present study employed a truncated relaxation induction followed by a brief "guided" IR experience followed by three minutes of "unguided" IR.

Optimal frequency of IR sessions is a poorly understood IR variable. Feltz and Lander's (1983) meta-analysis revealed no significant linear or curvilinear relationship between the number of IR sessions and effect size. The present study utilized five IR sessions over five days.

The optimal number of mental trials per IR session is another variable of MP that is in need of further investigation. Several researchers (Sackett, 1935; Smith and Harrison, 1962; Smyth, 1975) have suggested that a greater number of skill trials per IR period may have a

greater effect on performance than a smaller number of trials. An inference being made here is that a higher number of fast IR trials is preferable to a smaller number of "slow-motion" trials. Corbin (1972) and Twining (1949) suggest that there may be an optimal number of IR trials per session for a given skill. The meta-analysis of Feltz and Lander's (1983) indicates that for the dart-accuracy task utilized in this study having subjects try for eighteen trials per IR session may yield a higher performance increment.

An important procedural component of IR is the use of relaxation techniques attendant to the imagery itself. Suinn (1972a, 1972b, 1976, 1983) is the originator of a comprehensive system of IR training called visuo-motor behavior rehearsal (VMBR). Essentially, VMBR involves a progressive relaxation phase coupled with IR of a specific skilled performance with the intent of enhancing subsequent physical performance. Suinn (1983) is one of the foremost researchers in the area of IR techniques and sport performance enhancement, and his VMBR model has been used successfully in improving the performances of athletes in a variety of sport disciplines. Suinn (1983) and others (Noel, 1980; Hall and Erffmeyer, 1983; Lane, 1978; Kolanay, 1977) have investigated the question of combining relaxation and IR. Illustrative of their findings is Kolanay (1977) who conducted a study investigating the IR-relaxation "connection." She found that the VMBR procedure improved free-throw shooting percentage significantly over the relaxation-alone and imagery-alone groups who showed no change whatsoever. With respect to using audiotaped IR instructions, Surburg (1967) found that audiotaped presentation produced the greatest performance enhancement effect. The synergistic effects of combined IR

and relaxation are well-established (Silva, 1983). This study incorporated an audiotaped relaxation induction in both imagery treatment conditions and an audiotaped quasi-relaxation (relaxing sounds) induction in the relaxation/attention-placebo control condition.

There are three IR performance-related variables to consider in designing an IR study: (a) anxiety and arousal regulation, (b) attentional focus, and (c) self-efficacy. These performance variables have been shown to be amenable to modification through IR. Nideffer (1976b) has developed a system of classifying "attention" along two dimensions-- direction and breadth of focus, i.e., an individual may attend to either internal or external cues and her attention may range from broad to narrow in focus; a person's attentional focus will vary across both axes depending on the task and their psychological make-up. It may be inferred from Nideffer (1976b), Suinn (1983), and Mahoney (1979) that with respect to "closed" skills, e.g., darts, a narrow-external focus may be most appropriate. Borkovec and O'Brien (1977) corroborate this position and suggest that a focus on external features in a performance situation may reduce anxiety. IR procedures should be created and implemented with the attentional demands of the task considered in detail. An interesting observation by Lane (1978) was that the major benefit to an athlete from IR training appeared to be an increase in the ability to concentrate. This increased ability to concentrate and attend to the task-relevant elements in the environment (vis a vis past performance or task-irrelevant details, e.g., audience) may be crucial to improved performance and may be due in part to the observed anxiety-reducing capability of IR training (Weinberg, Seabourne, and Jackson, 1981). The detrimental effects of high levels

of anxiety and "overarousal" are well-documented (Martens, 1974). Bennett and Stothart (1978) and Gravel et al. (1980) noted that increased "body awareness" replaced rumination following an IR training program. Fisher (1976), Oxendine (1970), Landers (1977), Martens (1974), and Mahoney (1979, 1984) have also written regarding the deleterious effects of anxiety and "overarousal" and the need for anxiety cum arousal regulation procedures in competitive athletics. The present study utilized relaxation, attentional focus, and arousal regulation dialogue/instruction in both of the IR treatment conditions.

Self-efficacy (Bandura, 1977) plays a major psychological role in competitive athletics. Doyle and Landers (1980) found that self-confidence was by far the major factor in discriminating elite from sub-elite rifle and pistol shooters. Self-efficacy (which can be defined as skill-specific self-confidence) has been the subject of a series of studies by Weinberg et al. (1979, 1980, 1981a). These studies have consistently demonstrated the important role self-efficacy plays in successful skill performance. Mahoney (1979) suggests that IR may be one means of increasing feelings of self-efficacy. Feltz, Landers, and Raeder (1979) and Highlen and Bennett (1979) found that stronger expectations of personal efficacy accompanied better performance. The present study incorporated a single question devoted to the assessment of self-efficacy in the pre-treatment questionnaire to ascertain darts-specific feelings of personal efficacy.

In summary, the temporal and procedural design and performance-related variables discussed above have all been shown to relate to the performance enhancement effectiveness of IR techniques,

and were important considerations in the design and methodology of this study. The next section of the introduction reviews the theory and research pertinent to IR perspective, style, efficacy, and utilization.

Theory

The theoretical underpinnings of IR are far from well-documented at this stage of the research in the field. Currently there are three explanations for the positive effects of IR circulating in the literature: (a) neuromuscular feedback, (b) symbolic-learning, and (c) attentional-arousal set. Until recently, the most commonly held explanation for the effects of MP was the neuromuscular feedback theory.

Review articles by Corbin (1972), Richardson (1967b), and Weinberg (1981) have all mentioned a feedback theory as an explanation for the effects of IR. Until recently, this muscular feedback theory has been the accepted explanation for the facilitative effects of IR. This explanation-- called the psychoneuromuscular explanation-- is an outgrowth of the ideomotor principle (Carpenter, 1894; James, 1890a,1890b; Washburn, 1916) that postulated that low-gain neuromuscular efference patterns during imaginal movement should be identical to those produced during the same overt movement, but of a reduced magnitude. Researchers (Jacobson, 1930; Schramm, 1967; Shaw, 1940; Suinn, 1976) have all reported EMG activity during IR that appeared to mirror the pattern revealed when a subject was then asked to perform the task overtly. To date no controlled study has demonstrated that these covert patterns are identical to those in overt production, only of lesser magnitude. In fact, in a footnote to his 1982 study, Hale states that

the early stages of an investigation into this EMG relationship revealed that the muscular patterning in overt and covert performance was dissimilar, and of incorrect agonist-antagonist proportions. It would appear that the minute neuromuscular efference is more generalized than pattern-specific in nature, providing a tentative disconfirmation of the psychoneuromuscular feedback theory of IR.

An alternative explanation that was first proposed by Sackett (1934) is the symbolic learning theory of IR. This explanation of the beneficial effects of IR states that IR primarily serves to "entrench" the symbolic or cognitive aspects of a skill. This explanation maintains that IR facilitates subsequent skill performance only to the extent that cognitive elements are present in the skill; that is to say, the extent to which the athlete can rehearse the temporal and spatial aspects inherent in the skill. This theoretical position has received consistent support from empirical research (Minas, 1978; Morrisett, 1956; Ryan and Simons, 1981; Wrisberg and Ragsdale, 1979). It has also received support from the meta-analytic investigation of Feltz and Landers (1983). These authors go so far as to say that "...the distinctions between symbolic and motor aspects of motor skill learning are very robust and provide very strong support for the symbolic learning explanation" (Feltz and Landers, 1983, p. 45).

Feltz and Landers (1983) propose an alternative hypothesis which attempts to bridge the gap between the neuromuscular feedback and symbolic learning theories; it is referred to as the attentional-arousal set explanation (AAS) of IR. This theory attempts to explain the functional significance of the generalized minimal levels of muscular

tension identified by Hale (1982), Jacobson (1932), and Shaw (1940) in terms of symbolic learning theory. The AAS explanation posits that IR serves to facilitate performance by helping the athlete develop strategies for occupying the majority of his attentional capacity so that intrusive (task-irrelevant) thoughts are minimized, preventing disruption of the pre-performance muscle preparation process, i.e., setting the arousal level prior to the event. Feltz and Landers (1983) maintain that IR techniques work when they teach the athlete strategies that

> may enable the performer to concentrate more attention on the task while blocking disrupting thoughts. Thereby permitting greater efference to the performer's muscles so as to better prepare for good performance (Feltz and Landers, 1984, p. 51).

The present study subscribed to this explanation of MP as it fits best with this author's understanding of the IR process. The hypothesis of enhanced performance with an "internal" IR perspective meshes well with the AAS explanation, as this orientation promotes thought-stopping, appropriate attentional focus, and generation of optimal arousal regulation strategies. In addition, it appears highly likely that by helping the athlete block disruptive thoughts, focus on task-relevant stimuli, and set an appropriate skill-specific level of pre-performance arousal, IR is giving the athlete <u>control</u> which may in turn foster feelings of increased personal <u>efficacy</u> in the skill performance arena. Bandura (1977) posits that it is increased feelings of self-efficacy that lead to behavior change and he offers a variety of avenues for

engendering these feelings. Mahoney (1979) points out that self-efficacy can be a moderating variable in skill performance when the individual possesses the requisite athletic skill and "...it is not offered as a solution or alternative to skill development" (Mahoney, 1979, p. 429). Mahoney (1979) also suggests that IR (which he calls imaginal rehearsal) could be helpful in augmenting an athlete's self-efficacy expectations. The present study involved the imaginal rehearsal of a successful dart-throw in both of the treatment conditions. There were also questions regarding expectations of success, competence, and previous experience included on the (PEAQ) in order to assess the subjects' feelings of personal efficacy.

Imagery Rehearsal Perspective Research

Do the "internal" and "external" IR perspectives yield any differential effects on the subsequent physical performance of the mentally practiced skill? A perusal of the relevant research reveals an equivocal answer to this question. The following review of the literature highlights contradictory research, past methodological inadequacies in the study of IR, and discusses two additional subject characteristic measures included in this study. This section concludes with a position statement regarding a hypothetically optimal meld of IR variables, and a discussion of the hypotheses and research questions addressed by this investigation.

Research into the question of orientation in IR began in the very recent past. Mahoney and Avener (1977) conducted a descriptive study of elite gymnasts which revealed that the more successful athletes relied

on an "internal" imagery perspective during IR. All of the athletes reported using imagery extensively, but the Olympic qualifiers used an "internal" orientation more often than an "external" perspective during their IR. This questionnaire study touched off the "search for the perfect perspective." Following Mahoney and Avener's (1977) report of "internal" imagery perspective usage by high level competitors, there were several studies conducted attempting to replicate these findings with elite athletes from other sports disciplines. Subsequent descriptive studies with wrestlers (Highlen and Bennett, 1979), raquetball players (Meyers, Cooke, Cullen, and Liles, 1979), and skiers (Rotella, Gansneder, Ojala, & Billings, 1980) have yielded inconclusive and equivocal results with respect to perspective adopted by athletes during IR.

Doyle and Landers (1980) conducted a descriptive study of elite and subelite rifle and pistol shooters using a revised Mahoney and Avener (1977) questionnaire. These authors found that the elite shooters used predominantly internal imagery while their less skilled counterparts used a mixture of internal and external imagery. Suinn and Andrews (1981) utilized a modified Mahoney and Avener (1977) questionnaire with elite Alpine skiers and found no trends in perspective usage during IR. Highlen and Bennett (1979) also used a modified Mahoney and Avener (1977) questionnaire in their descriptive study of elite wrestlers. These authors reported no significant trends towards internal or external perspective with this sport population. The authors go on to suggest that perhaps the elite wrestler's moderate use of IR as compared with gymnasts' might be a function of the basic differences in the two sports, i.e., the "open" vs "closed" nature of the tasks. A perusal of

the pertinent literature would appear to corroborate their speculation. The research suggests that internal IR perspective is correlated with IR by elite "closed" skill athletes whereas "open" skill athletes utilize other performance preparation strategies. Shick (1970) wrote anecdotally that the female volleyball players in her study reported using primarily an external IR perspective while mentally rehearsing a serve, but in the IR of a wall-volley they switched from an initial external perspective to an internal perspective after beginning the series of mental trials. It should be kept in mind that all of the aforementioned studies are descriptive or simply anecdotal in nature. An examination of the empirical research is necessary before drawing any firm conclusions.

Hale (1982) attempted a replication of Jacobson's (1931) study of perspective-dependent (visual and kinesthetic) site-specific muscular activation. Hale found that imagery which more completely involves the subject in the visual and kinesthetic elements of an experience is more apt to produce site-specific neuromuscular efference than simply visualizing the experience. Hale found no significant relationship between strength of EMG response and vividness of imagery. He also found no significant relationship between natural imagery perspective (the perspective the subject adopts naturally when asked to imaginally rehearse an experience or task) and the degree of EMG or EOG efference. Hale reports that a relaxation induction helped to quiet "background" EMG activity and, thus, aided the imagery manipulation. He also reported that internal IR produced greater localized muscular concomitance than did external IR.

Davidson and Schwartz (1977) recorded EEG activity during self-generated visual and kinesthetic imagery and found a correspondence between visual imagery and increased occipital activation. They also report a correspondence between kinesthetic imagery and increased sensorimotor activity. The authors note that their findings "...suggest that the generation of an image in a particular modality is associated with relative activation in the cortical region involved in information processing in that modality" (Davidson and Schwartz, 1977, p. 601). An examination of the findings of Hale (1982) and of Davidson and Schwartz (1977) indicates that visual and kinesthetic imagery produce different responses in different cortical regions (EEG activity), and in different muscles groups (EMG activity). Do these differential EEG and EMG responses to internal and external IR translate into differences in performance? The question does not appear to be that straightforward.

Only a few empirical studies have attempted to investigate the relative effects of IR perspective on sport performance. By and large, these studies have been poorly controlled, and are fraught with methodological inadequacies. Barnes (1982) investigated the relative effectiveness of internal and external IR as "mental preparation strategies" for intermediate league bowlers. He found no significant differences between either of the imagery rehearsal groups or between any of the four (internal IR, external IR, relaxation, no-contact control) groups. (In this study it was difficult to determine how the four groups were initially equated or how the IR was practiced.) Barnes (1982) cited loss of motivation as a possible explanation for the lack of significance. Bowling can be considered the quintessential "closed" sport activity, which makes the negative outcome of this study

especially interesting in light of the findings of the aforementioned descriptive studies, e.g., Highlen and Bennett (1979).

McFadden (1982) conducted a study of the internal and external IR perspectives utilizing adolescent hockey goaltenders. Using measures of response time and saves, he found that both internal and external imagery were effective at improving goal-tending skills relative to a film placebo and delayed treatment controls. The two IR perspectives were not significantly different from each other, however. The study utilized four, one-hour treatment sessions which research has shown to be too long a time for an IR session (Feltz and Landers, 1983).

In a widely cited quasi-experimental study, Epstein (1980) sought to investigate the relationship between mental rehearsal, natural imagery style, and performance. Subjects were divided into internal IR, external IR, and control groups. The study was conducted in four phases: imagery assessment and baseline dart-throwing, imagery training, dart-throwing aided by IR, post-experimental questioning. Neither the internal nor external IR group improved significantly more than the control group. Suinn (1983) criticizes this "attempt" at a controlled study stating that

> the entire process took one hour (all four phases); this period probably is too short to enable any subject to convert the mental practice instructions into an imagery rehearsal process. That is, is seems unlikely that a person can learn to relax or develop controlled imagery during this brief exposure (Suinn, 1983, p. 528)

Given that Epstein's (1980) study is one of the better studies of the few that have been done in this area, Suinn's (1983) comment suggested a more thorough and controlled study was required to properly investigate the "internal-external" question. The present study sought to improve upon the work of Epstein (1980) and to incorporate many of the recommendations for improving IR made since then (Feltz and Landers, 1983; Suinn, 1983). The following is a list highlighting the design and methodology components of this study:

(1) This study utilized darts as the performance outcome measure because of their precedented use by Vandell et al. (1943), Mendoza and Wichman (1978), and Epstein (1980). Dart-accuracy is an easily quantified measure that allows for incremental measurement along a performance gradient vis-a-vis "all-or-none" measures, e.g., free-throws. Darts is a "closed" precision motor skill with generalizability to other sports. Research indicates that IR may be more effective with "closed" skills (McBride and Rothstein, 1979).

(2) Both men and women were utilized which allowed for a comparison of IR utilization across gender.

(3) A combination of IR and physical practice periods was utilized as providing pre- and post-IR physical practice periods has been shown to increase the efficacy of IR in improving performance (Luebke, 1967).

(4) Subjects were instructed in dart-throwing via videotaped demonstrations as observational instruction has been shown to be superior to reading (Brassie, 1968).

(5) This study utilized the findings of Feltz and Landers (1983) with respect to number of trials per IR session (approaching 18) and length of IR period (approximately seven minutes including relaxation phase).

(6) Anxiety (Sport Competition Anxiety Test (SCAT)) and locus-of-control (Rotter's (1966) Internal-External Locus-of-Control Scale (LOC)) measures were taken to assess: (a) subjects' level of competitive anxiety, and (b) locus-of-control (Rotter, 1966) which have been shown to be potential mediating factors in performance enhancement via IR (Lane, 1978).

(7) Manipulation checks were utilized in all three conditions to assess the degree and nature of subjects' involvement with the procedures (Weinberg, Seabourne, and Jackson, 1981).

(8) A relaxation induction was included as a component of the IR procedure given that it has been shown to be effective in enhancing the IR process (Kolanay, 1977).

(9) The study utilized high quality imagery and relaxation audiotapes in addition to comfortable chairs, professional-quality headphones, and quiet surroundings.

(10) Previous experience with darts, and sports in general, was assessed as were imagery style, feelings of personal efficacy, and

attitudes towards darts. An imagery-style questionnaire adapted from Epstein (1980) was used to assess vividness of the images as well as the presence of auditory, olfactory, and kinesthetic elements. IR perspective and the "switching" phenomenon were assessed, too.

(11) There was a single videotaped demonstration of correct dart-throwing technique which research has shown to be an effective teaching aid (Bandura, Ross, and Ross, 1963; DelRay, 1971; Landers and Landers, 1973; Landers, 1975).

(12) This study utilized an attentional-placebo/relaxation control group (Weinberg, Seabourne, and Jackson, 1981) to help control for expectancy effects (Williams, 1970; Hanson, 1967).

(13) Subject motivation was a primary concern in designing this study. Andre (1985) and Barnes (1982) reported "loss of motivation" as a possible explanation for the lack of significance in their IR studies. This study was designed to be interesting, enjoyable, and useful for the subjects. The generalizability of the IR training to other sport activities was emphasized. A goal-setting procedure was utilized to generate enthusiasm for the project (Alderman and Wood, 1976). Research staff maintained a high level enthusiasm and involvement with the subjects, providing non-judgemental, non-evaluative encouragement.

Primary Hypotheses

1. The internal imagery group will outperform the external imagery group which will in turn score higher on the dart-accuracy measure that the RAPC.

2. The internal IR males will outperform the external IR males.

3. The external IR females will outperform the internal IR females.

Subsidiary Research Questions

1. Will imagery rehearsal from an internal perspective differ in its effects on performance relative to IR from an external perspective?

2. Will men and women differ in their ability to utilize and benefit from internal and external IR?

3. Will IR from either perspective prove superior to a relaxation attention-placebo procedure?

4. Will men and women differ in their natural imagery styles?

5. Will men and women differ in their levels of sport performance anxiety?

CHAPTER II

METHOD

Subjects

Subjects for the study were 48 (24 male/24 female) college students drawn from the introductory level psychology class (PSYC 110) experimental subject pool at the University of Montana. These subjects were volunteers who received credit towards their "experiment" requirement for their participation in the study "Enhanced Sports Performance." These volunteers were randomly assigned to the internal IR, external IR, and relaxation/attention-placebo control groups.

Apparatus

Equipment used for the performance outcome measure included fifteen (15) eighteen-gram Sportcraft darts, and three targets, each consisting of ten concentric circles 2.23 cm apart. The central circle (bullseye) was black, and the remaining circles (high contrast blue on yellow) of increasing radius were numbered 9 to 1. These numbers represented the number of points awarded to subjects for darts landing within that ring. The target's size, height above the floor, and distance from the subjects were all dictated by the formal rules of the sport (McClintock, 1977) as illustrated in Figures 1 and 1a.

Insert Figures 1 and 1a about here

A Marantz Professional Cassette Recorder (Model PMD 220) was used to play the audiocassettes in all three conditions. The cassette recorder was used to power eight sets of stereo headphones (Koss Model K-6). An RCA SelectaVision VHS Video/Cassette Recorder (Model VJT250) and a 19-inch RCA ColorTrak Lyceum television (Model JD 975wv) was used for viewing the demonstration videocassette.

Design

The study employed a 3(treatment) X 2(gender) X 2(repeated measures) factorial design. The effects of the three conditions (internal IR, external IR, RAPC) were analyzed relative to gender (male and female) across trials (pre- and post-treatment).

Procedure

Pre-Treatment Performance and Subsidiary Measures Procedure All subjects registered for the experiment at the "Experimental Sign-up Table" on the second floor of the Psychology-Pharmacy Building. At the time of registration, subjects arranged a time for pre-treatment testing and measurement on either the Saturday or Sunday preceding the treatment treatment week. All testing and treatment took place in the

Psychology-Pharmacy Building at the University of Montana. Subjects arrived at the Psych-Pharm Building and were met by an experimental assistant (who was blind to the experimental hypotheses) and escorted to Room 304. Roll was taken and the subjects were given a brief introduction to the study. Subjects were required to sign a contract which defined their obligations and responsibilities as well as those of the experimenter (See Appendix C). (See Appendix B for complete pre-treatment instructions.) The subjects then completed the three pencil and paper measures (SCAT, LOC, and PEAQ) (see Appendices D, E, and F). After completing these measures, subjects viewed a 90-second videocassette demonstration of "a correct method of throwing a dart." The experimental assistant explained the performance measure (darts) procedure and each subject took fifty attempts at the target-- ten flights of five darts. Subjects were tested in groups of ten with each subject rotating through the three dart-throwing stations. Each dart was assigned the score that corresponded to its ring-location on the target. Darts that fell off the board were scored '0', and those darts that stuck in the board and then fell out were re-thrown. Darts that landed on a line were scored the lower value. The average pre-treatment performance score was the sum of these fifty scores divided by fifty. All scores were recorded by the experimental assistant. Following the completion of all the pre-treatment measures the subjects were assigned a daily meeting time for the next five days, thanked, and released.

Internal Imagery Rehearsal (IIR) Procedure The procedures for the five-day treatment phase were as follows: The first night of the

treatment phase subjects (groups of eight) in the IIR condition arrived at the prescribed time and were met by the research assistant and experimenter. They were escorted to the dart-throwing area where, following a brief explanation of the procedure, they each threw five warm-up darts. Subjects were then seated in padded chairs and read instructions per Appendix J (IIR), donned headphones, and listened to a truncated cognitive-imaginal relaxation procedure. Following the relaxation phase, subjects were guided through a successful imaginal dart-throw with specific attention being called to the kinesthetic and affective components of the imagery from a first-person perspective. Following this guided imagery rehearsal trial there was a three-minute unguided IR period. Subjects were asked to keep track of the number of imaginal dart-throws they attempted during this period. Following the IR period subjects were asked to complete a manipulation check (see Appendix I) and were instructed to throw five more darts before leaving. They were then released with the instruction to return at the appointed time the following evening with the admonition not to discuss the details of the experiment with anyone until it was over. They were also instructed to refrain from practicing darts (mentally or physically) until the experiment was completed. This procedure was repeated with each group each evening of the five-day treatment phase.

External Imagery Rehearsal (EIR) Procedure Subjects in the EIR condition were treated in exactly the same fashion as the IIR condition with one variation in the treatment. Subjects in the EIR received their rationale and instructions per Appendix J (EIR). This IR instructional set emphasized the visual components of the IR experience

from a third-person perspective. All other procedural components were identical to those of the IIR group.

Relaxation/Attention-Placebo Control (RAPC) Procedure Subjects in the RAPC group were treated in exactly the same manner as the IIR and EIR groups with one major variation in their treatment. Subjects in the RAPC condition received their rationale and instructions per Appendix J (RAPC). The RAPC instructional set stated that the experimental hypothesis was that listening to a series of audiocassette recordings of "relaxing" sounds would have a beneficial effect on their darts performance. These subjects listened to approximately eight minutes of relaxing sounds (see Appendix J, RAPC), e.g., wind and rain. Each night there was a different relaxing sound. The manipulation check for this condition differed from the IR conditions (see Appendix H). All other procedural components of the RAPC condition are identical to those of the IIR and EIR groups.

Post-Treatment Assessment Procedure At the end of the final treatment session all subjects were required to sign-up for a post-treatment assessment session on either of the next two days--Saturday or Sunday. Subjects were tested in a slightly different fashion than that used with the pre-treatment measures (see Appendix K): (a) there was no 90-second videocassette dart-throwing demonstration prior to the dart-accuracy measure, (b) subjects threw ten flights of darts (five each flight) in rotation through the three stations, (c) subjects were then escorted to Room 304 where they were administered a post-treatment questionnaire, and (d) at the end of

each post-treatment assessment session subjects were debriefed (see Appendix L), thanked again for their cooperation, awarded experimental credit, and released.

Additional Measures

There were two subsidiary measures utilized in this study, in addition to the dart-accuracy performance outcome measure. These two instruments were:

1. Internal-External Locus-of-Control Scale: This scale was developed by Rotter (1966) to measure differences in where individuals perceive the sources of reward and reinforcement to lie, i.e.,

> ...the degree to which the individual perceives that the reward follows from or is contingent upon, his own behavior or attributes versus the degree to which he feels the reward is controlled by forces outside of himself and may occur independently of his own actions (Rotter, 1966, p. 1).

This is a twenty-nine item forced-choice scale which Lane (1978) has indicated may have some predictive validity with respect to success with IR procedures. Norms are available for college populations.

2. Sport Competition Anxiety Test: This test was developed by Martens (1977) to assess sport-specific trait anxiety. The author cites research indicating that this instrument is a superior predictor of (competitive) state anxiety when compared with general trait anxiety

inventories. This fifteen-item 3-point Likert-type scale will be used to assess baseline levels of competitive anxiety. Norms are available for college populations.

These measures were included to assess for these possible mediating variables, and thereby help to control and account for any potential between-group differences that may have affected the outcome in some manner for which there were no controls.

CHAPTER III

RESULTS

This section reports the results for all of the measures utilized in this study in a manner corresponding to the order in which the subjects were tested and/or assessed from pre- to post-treatment.

Imagery Questionnaire Data

The data from the imagery style questionnaire was analyzed using a 3(group) X 2(gender) X 13(item) Ullrich-Pitz Analysis of Variance (ANOVA). Significance was determined at the .05 level alpha. Subjects were asked to rate four images (peeling an orange, dialing a telephone, riding an elevator, throwing a Frisbee) along thirteen dimensions (See Appendix A). No gender or treatment group differences were found for either the 'elevator' or 'telephone' images on any of the thirteen items, however, for the 'orange' and 'Frisbee' images gender differences were found for several items.

Insert Table 1 about here

In rating both the 'orange' and 'Frisbee' images, item 1 (clarity of image) and item 3 (olfactory sensation), females subjects reported significantly better clarity and more olfactory sensations than did the

male subjects (orange/clarity: $F(1,42)=7.33$, $p=.008$; orange/olfactory: $F(1,42)=10.0$, $p=.003$; Frisbee/clarity: $F(1,42)=4.63$, $p=.030$; Frisbee/olfactory: $F(1,42)=6.12$, $p=.017$). The only other significant findings were for items 2 (auditory sensation) and 4 (feeling textures) for the 'orange' imagery stimulus (orange/auditory: $F(1,42)=4.48$, $p=.038$; orange/textures: $F(1,42)=4.33$, $p=.041$). Results suggest greater imagery involvement for the female subjects along certain dimensions.

Sport History and Attitude Questionnaire Data

The sport history and attitude questionnaire provides a global picture of the forty-eight subjects personal histories of sport participation and assessed their attitudes, feelings, motivations, and interests with respect to darts (the performance measure) and the experimental setting/study itself.

Insert Table 2 about here

The subjects' responses to the Sport History and Attitude Questionnaire were analyzed with a 3(treatment) X 2(gender) X 13(item) Ullrich-Pitz ANOVA. Significance was determined at the .05 level alpha. Table 2 provides an item by item analysis of the subjects' questionnaire responses with item means reported for all three groups. The results indicate a uniformly athletic (items 1 and 2), motivated (items 3 and 15), and relatively inexperienced (with respect to the performance

measure) group of eighteen year-olds (mode age). Sex differences were anticipated for several of the questions; in particular, items 6 and 11, however, the only statistically significant difference was on item 12. This item called for the subject to predict (implicitly set a goal) a percentage they felt they could improve their pre-treatment performance score. Though there were no significant between-group differences, the male subjects consistently predicted they could improve their scores a significantly higher percentage than did the female subjects ($F(1,42)=4.23$, $p=.043$). Interestingly, this same difference was not found for item 5, suggesting a lack of sensitivity on the part of this Likert-scaled item.

None of the other items were statistically significant. The free-response items (13,14,15,17) revealed several noteworthy features of this athletically-minded collegiate group. For the most part both male and female subjects reported that their favorite sport (item 14) was also the sport at which they were most adept (item 15). The top 3 favorite sports for men were basketball, football, and track. For women it was track (!) at number one, with swimming, jogging, and basketball all vying for second. Skiing, kayaking, and volleyball were frequently cited as favorites, as well.

Item 13 yielded nine post hoc categories of "responses to performance errors." They were (in order of popularity): (a) frustration, (b) anger, (c) forgetting it, (d) none, (e) curse self/get down on self, (f) learn from the mistake, (g) disappointment/get depressed, and (h) try harder. Note: When the decision was made to consolidate the

originally separate "disappointment" and "get depressed" response categories, interrater reliability reached 100%.

Item 16 concerned aspects of the subjects' sports performance they felt were most in need of improvement. Subjects' responses were grouped into ten post hoc categories and again, interrater reliability was 100%. These categories included (in order of popularity): (a) concentration, (b) determination, (c) anger control, (d) learning from mistakes, (e) none,, (f) physical skill improvement, (g) regaining and maintaining competitive composure, (h) confidence, (i) relaxation, and (j) maintaining performance consistency. Considered, in toto, the responses to these two items (response-to-error style and performance deficit amelioration) suggest that these subjects were aware of how they respond to performance errors, e.g., predominantly anger, frustration, and denial. The responses also suggest that the subjects were relatively aware of where they need help in improving their sports performances, e.g., increased concentration and anger control. Anecdotally, several subjects requested further information on how they could improve the psychological aspects of their sports performance.

Sport Competition Anxiety Test (SCAT) and Rotter's Internal-External Locus-of-Control Scale (LOC)

The Sport Competition Anxiety Test and Internal-External Locus-of-Control Scale scores were analyzed using a 3(treatment) X 2(gender) Ullrich-Pitz ANOVA routine. Significance was determined at

the .05 level alpha. Results for both the SCAT and the LOC were non-significant. Means for each scale are reported in Table 3.

Insert Table 3 about here

Performance Measure Data

The pre- to post-treatment performance outcome measure scores were analyzed with a 3(treatment) X 2(gender) X 2(repeated measures) Ullrich-Pitz ANOVA routine. Significance was determined at the .05 level alpha. The analysis indicated significant main effects for the gender ($F(1,42)=37.402$, $p=.000$) and repeated measures factors ($F(1,42)=39.805$, $p=.000$). These values indicate that male subjects scored significantly higher scores on the ballistic performance measure (darts) than the female subjects in all three conditions. The values also indicate that all three conditions improved pre- to post-treatment. A Newman-Keuls multiple comparison analysis of the pre- and post-treatment scores indicated the following: (1) the internal imagery rehearsal group's (IIR) post-treatment performance score was significantly higher than the IIR and the external imagery rehearsal group's (EIR) pre-treatment score (2) the EIR post-treatment score was significantly greater the EIR pre-treatment score, and (3) the relaxation/attention placebo control (RAPC) group post-treatment score was significantly greater than the EIR pre-treatment score. Thus, it would appear that both of the treatment conditions improved to a

significant degree while the RAPC group failed to do so. None of the post-treatment scores were significantly different.

Insert Figure 1 about here

Two additional methods for reporting the performance results include percentage improvement and change scores. Inclusion of these analyses helps to clarify the nature of the pre- to post-treatment improvement exhibited by all three groups.

Insert Table 4 about here

A percentage of improvement was calculated for each group (treatment X gender) and is listed in Table 4. An examination of these percentages reveals that the external imagery female (EIF) condition improved nearly 21% from pre- to post-treatment relative to 1.8% and 4.4% improvement for the male and female relaxation/attention placebo control conditions. Change scores (treatment X gender) were also calculated for each condition and are included in Table 4. The percentage of improvement was determined by subtracting the pre-treatment score from the post-treatment score and then dividing this value by the pre-treatment score. Change scores were calculated by subtracting the pre- from the post-treatment scores. A Newman-Keuls multiple comparison analysis of

the change scores indicated that only the EIF condition (greatest improvement increment) improved significantly more than the male RAPC group (lowest improvement increment).

Manipulation Check Data Analysis

Data analysis for the treatment and relaxation/attention-placebo control manipulation checks was a three-part process. First, the RAPC manipulation check data was analyzed, then the imagery treatment group manipulation checks, and finally, the four items common to all three groups were analyzed together.

Attentional Placebo/Relaxation Check Data

Data from the five Likert-scaled items on the five-day relaxation check was analyzed with a 2(gender) X 5(repeated measures) X 5(item) Ullrich-Pitz ANOVA. A 2(gender) X 5(repeated measures) X 2(item) ANOVA was also performed on the two dichotomous items. Significance was determined at the .05 level alpha. Several significant differences were found for the Likert-scaled items; however, both of the dichotomous items proved non-significant (NS). These findings are comprehensively reported and discussed below.

Recall that the attentional placebo/relaxation control group procedure called for the subjects to "relax and listen" to five different recordings of "naturally relaxing sounds", a different sound for each day of the treatment week. The "naturally relaxing sounds" for the five

sessions were (in order of presentation): lagoon sounds, swamp sounds, wind, aviary, and beach sounds.

Insert Table 5 about here

The ANOVA for item one (Relaxation?) was significant for the repeated measures factor only ($F(4,56)=5.23$, $p=.0015$). Inspection of the data revealed that for item 1 both male and female subjects began at a relatively high level of relaxation and gradually deepened this already highly-relaxed state (with the notable exception of session two). A Newman-Keuls multiple comparison analysis indicated that the mean for the second day of the treatment week (swamp sounds at dusk) was the only score that differed significantly from the rest. Verbal reports and written responses to item 8 from the RAPC group revealed that the swamp sounds were, for the most part, far from relaxing, and were found by most to be annoying and aggravating (especially annoying, was that many subjects couldn't identify the noises and were disturbed by this). Few subjects were able to identify the sounds as originating from a swamp (crickets, bullfrogs, etc.). Reports of 'construction site' and 'alien planet' were among the subjects' proferred speculations regarding the origin of the sounds. Their near-unanimous deprecation of this audio-relaxation selection impacted all of the other manipulation check items for this day of treatment.

The ANOVA for item 2 (Images?) revealed statistically significant quantities of dart-related images during relaxation with the male subjects reporting more images than the female subjects ($F(1,14)=5.88$, $p=.028$). It should be noted that though the males reported more images than the females, both sexes reported very few images and that as a group the RAPC reported far fewer images than either of the imagery rehearsal treatment groups.

The ANOVA for item 3 (Benefit?) revealed a significant difference on the repeated measures factor ($F(4,56)=4.74$, $p=.002$). A Newman-Keuls multiple comparison analysis indicated that only the item mean for session two (swamp sounds) differed significantly from the other session means. Aside from this single daily variation, inspection of the other four daily item means indicates that as a group the RAPC believed the training program would significantly benefit them and had a high degree of credibility. Item four (better at darts?) though non-significant (NS) did reveal that the male subjects felt that the training program would improve their dart-throwing, whereas the female subjects were more skeptical of its efficacy.

The ANOVA for item 5 (Relax completely?) indicated statistical significance for the repeated measures factor ($F(4,56)=3.48$, $p=.013$). Again, session two (swamp sounds) was responsible for this difference. A Newman-Keuls multiple comparison analysis indicated that this daily item mean alone was significantly different from the other four means. An inspection of the daily means reveals that overall, both male and female subjects began at a moderate level of relaxation and gradually deepened this state as the week progressed. There is also a statistical

trend indicating that the male subjects were able to relax more deeply over the course of the five sessions relative to the female subjects ($F(1,14)=3.20$, $p=.092$).

The ANOVA's for items 6 (Practice?) and 7 (Dreams?) were both non-significant and indicate that all of the subjects in the RAPC completely refrained from extra-session darts practice and had no dreams or daydreams regarding darts. Item 8 was a free-response item that elicited little additional information from the subjects outside of comments about the relaxing (or in the case of the 'swamp sounds,' annoying) nature of the audio-relaxation selection of the day.

Common Manipulation Check Items

The next step in the statistical analysis of the manipulation check data involved performing a 3(treatment) X 2(gender) X 4(item) Ullrich-Pitz ANOVA on the items common to the manipulation checks for both the RAPC and imagery rehearsal conditions. Significance was determined at the .05 level alpha. The intent of the four common items was to ascertain the following:

(1) How relaxed were the three groups relative to each other?

(2) Were there any differences in the amount of imagery occurring during the three procedures?

(3) Did all three groups perceive the training program(s) as beneficial?

(4) Did they believe the training program would improve their dart-throwing?

Results of the ANOVA are as follows:

(1) The ANOVA for item one (How relaxed did the tape make you feel today?) indicated a significant main effect for the treatment factor ($F(2,42)=4.55$, $p=.016$) which indicates that both the internal and external groups were able to progressively achieve a deeper level of relaxation than the RAPC group. However, a Newman-Keuls multiple comparison analysis revealed that again the RAPC low scores for session two (swamp sounds) were responsible for this effect. This single extreme fluctuation accounts for the significant difference as all of the other daily means do not significantly differ from one another. Although the ANOVA also revealed a significant main effect for the repeated measures factor ($F(4,168)=3.80$, $p=.006$) and an interaction for the treatment and repeated measures factors ($F(8,168)=2.465$, $p=.015$) all of these findings can be explained by the session two (swamp sounds) RAPC anomaly. An inspection of the daily group means revealed that the internal imagery rehearsal group achieved a deeper level of relaxation overall than either the RAPC or EIR groups; but this deeper level of relaxation would not have been significantly different were it not for the session two RAPC decrement, and was non-significant with respect to the EIR. Further inspection of the daily item one means indicated that all three groups, on all five days (with the lone exception being RAPC session two) were able to achieve and improve upon a relatively deep level of relaxation.

(2) The ANOVA for item 2 (Did you experience any images related to darts today while listening to the tape?) revealed a significant main effect for the treatment factor ($F(2,42)=54.536$, $p=.0000$). The two imagery rehearsal treatment groups experienced significantly more dart-related imagery during the sessions than did the RAPC group. There was also a significant interaction between the treatment and gender factors ($F(2,42)=4.68$, $p=.023$). A Newman-Keuls multiple comparison analysis indicated that the IIF, IIM, EIF, and EIM conditions experienced significantly more dart-related images than the female RAPC group, and further that the IIF condition alone reported more imagery than the male RAPC group. An inspection of the daily means indicates that both of the imagery rehearsal treatment groups experienced greater imagery relative to the RAPC group, but they (internal and external imagery rehearsal groups) did not differ significantly from each other.

(3) The ANOVA for item 3 (Do you believe that this program will be beneficial to you in any way?) revealed both a repeated measures main effect ($F(4,168)=3.575$, $p=.008$) and a treatment X repeated measures interaction ($F(8,168)=3.15$, $p=.003$). An inspection of the daily means indicates that, once again, the mean fluctuation for the RAPC condition during session two (swamp sounds) generated the significant difference, and further revealed that all three groups felt that the training programs they were involved in were of equivalent and substantial benefit.

(4) The ANOVA for item 4 (Do you think this training program will assist you in becoming a better darts player?) indicated that there were main effects for the treatment ($F(2,42)=3.62$, $p=.034$) and repeated measures factors ($F(4,168)=2.577$, $p=.039$). These results indicate that the imagery treatment groups found their training programs to be superior to that of the RAPC condition, but not significantly different from each other. Inspection of the daily means across groups reveals that there was considerable daily variation initially (especially the RAPC session two), but that overall, the RAPC felt less certain of the darts performance-enhancing ability of their training program.

Internal and External Imagery Rehearsal Manipulation Check Data

The final step in analyzing the manipulation check data was to investigate the subjects responses to the two imagery rehearsal conditions. The results of this analysis (item means) are listed in Table 7. The results of this twenty-five item questionnaire are as follows (items 23 and 24 being free-response inquiries):

A separate Ullrich-Pitz 2(treatment) X 2(gender) X 5(repeated measures) ANOVA was performed on each of the twenty-one Likert-scaled items from the imagery rehearsal check. In addition, an Ullrich-Pitz 2(treatment) X 2(gender) X 5(repeated measures) ANOVA was performed on the two dichotomous items. There were no significant between-group, gender, or repeated measures differences for items 1,3,6,13,15,17,22,or 25. An inspection of these NS results is, nonetheless, edifying.

A perusal of the NS item means suggests that both groups initially achieved a deep level of relaxation that they were able to improve upon as the week progressed. Both groups reported a moderately high level of motivation with some daily variation. Both imagery groups reported moderately vivid imagery with a slight increase as the week progressed. With respect to their experiences of bodily sensation both the IIR and EIR groups reported a moderate level of controllability with anecdotal reports suggesting that these sensations paralleled the instructions given on the tape. All subjects reported feeling that the program would benefit them to a moderately great extent. Both imagery rehearsal groups reported hearing few dart sounds during the taped practice sessions. The results of the two dichotomous items (extra-session practice and dreams) suggest that nearly all of the subjects complied with the directive that they refrain from practicing darts, both mentally and physically, outside of the sessions, and that subjects, for the most part, had few or no darts-related dreams or daydreams during the treatment week.

Significant Findings

There were a number of significant findings for the imagery rehearsal check, and they are enumerated below:

(a) The ANOVA for item 2 (Were you able to relax more completely than yesterday?) revealed a significant main effect for the repeated measures factor ($F(4,112)=3.241$, $p=.015$). An inspection of the daily means indicates that for session one, subjects reported a

level of relaxation equivalent to that experienced during the pre-treatment session; for sessions two through five, reported experiencing moderately high levels of relaxation with some daily variation.

(b) The ANOVA for item 4 (How clear or "real" was your imagery darts practice session today?) indicated that there was a significant main effect for the repeated measures factor ($F(4,112)=2.760$, $p=.030$). Inspection of the daily means indicates that there were minor daily fluctuations in reported 'clarity' within a relatively narrow response band (4.53-4.90), with no discernibly meaningful pattern to the results.

(c) The ANOVA for item 5 (Did you experience any images related to darts today during the session?) indicated a significant interaction for the gender and repeated measures factors ($F(4,112)=6.372$, $p=.000$). Again there appears to have been minor daily fluctuations with the male and female subjects responding differentially to the imagery rehearsal procedures. Both sexes reported experiencing images during their rehearsal periods.

(d) The ANOVA for item 7 (Control of imagery?) indicated both a main effect for the repeated measures factor ($F(4,112)=2.52$, $p=.044$) and a significant interaction between the gender and repeated measures factors ($F(4,112)=2.75$, $p=.031$). An inspection of the daily means indicates a sharp increase in control during session two, with a small decrement during sessions three and four, followed by a small

increase during the final session. Additional examination of the gender and repeated measures interaction suggests that, following a similar starting level for both male and female subjects (4.25-4.37), there was an sharp increase in control during session two, after which there were three sessions of moderate variation in the reporting of "control" with both sexes fluctuating with a narrow response band of 4.18 to 5.19.

(e) The ANOVA for item 8 (Did you switch perspective during today's session?) yielded a three-way interaction between the treatment, gender, and repeated measures factors ($F(4,112)=2.969$, $p=.022$). An inspection of the daily means and the accompanying figures indicates several things: (a) both the IIR and EIR males reported a gradual decrease in the amount of switching they experienced during imaginal rehearsal, and (b) although the IIR and EIR female subjects began at nearly the same level, the EIR group experienced a gradual increase in switching, while the IIR group reported differing levels of switching for sessions two through four, and overall, a diminution in switching. In summary, it appears that the IIR (males and females) experienced a decrease in switching, as did the EIR males; however, the EIR females reported an increase in switching.

Insert Figures 2 and 3 about here

(f) The ANOVA for item 9 (Which perspective?) indicated a significant main effect for the treatment factor ($F(1,28)=28.39$, $p=.0000$). This finding indicates that the two treatment groups were able to imaginally rehearse in their assigned perspectives- with the internal imagery condition reporting imagery closer to the pure 'player' pole than the external imagery condition was to the pure 'spectator' end of the imagery perspective continuum (IIR=5.40, EIR=3.11).

(g) The ANOVA for item 10 (Were you able to maintain and control the prescribed perspective?) also indicated a three-way interaction between the treatment, gender, and repeated measures factors ($F(4,112)=3.010$, $p=.020$). Inspection of the daily means revealed that both the male and female subjects in the EIR reported a moderate increase in control, while the male IIR subjects reported a decline in control to a level roughly equivalent to that of the EIR. The female IIR subjects exhibited wide daily fluctuations in control, and ended treatment reporting the highest level of control.

(h) The ANOVA for item 11 (Did you experience bodily sensations?) revealed both a significant main effect for the gender factor ($F(1,28)=4.67$, $p=.037$) and a significant interaction between the gender and repeated measures factors ($F(4,112)=3.55$, $p=.009$). Females reported significantly more bodily sensations overall during imagery rehearsal and they also reported more bodily sensations on a daily basis over the course of the treatment week

vis a vis the male subjects, with both reporting moderate levels of bodily sensation.

(i) The ANOVA for item 12 (Intensity of bodily sensations?) indicated a main effect for gender ($F(1,28)=8.69$, $p=.006$). Female subjects reported significantly greater intensity with respect to their imaginally experienced bodily sensations relative to the male subjects. This fits with the finding that female subjects, in general, experienced more feelings of bodily sensation.

(j) The ANOVA for item 14 ("Speed" of imagery?) revealed a main effect for the repeated measures factor ($F(4,112)=5.561$, $p=.000$).

Insert Figure 4 about here

As this figure clearly illustrates the subjectively experienced "speed" of the imagery decelerated significantly as the treatment progressed, until it nearly reached the level of slowest possible "speed" on this Likert-scaled continuum, i.e. "Very Slow Motion Speed." A non-significant ancillary finding suggests a trend towards the IIR experiencing slower-motion imagery relative to the EIR ($F(4,112)=2.126$, $p=.081$).

(k) The ANOVA for item 16 (Will this program enhance your darts-playing?) indicated an interaction between the treatment and

repeated measures factors ($F(4,112)=3.345$, $p=.012$). An inspection of the daily means reveals that initially the IIR felt their program was a more credible training procedure than did the EIR, but over the course of the treatment week this belief pattern reversed itself. By session five the two groups had reversed expressed opinions, with the EIR espousing greater belief in the darts-enhancing capability of their treatment program, relative to the diminished opinion of the IIR. However, it should be noted that despite this reversal, both groups still expressed a high level of confidence in their training programs.

(l) The ANOVA for item 18 (Were you able to "feel" textures?) indicated a main effect for treatment ($F(1,28)=5.85$, $p=.021$). This indicates that the IIR experienced a significantly higher level of textural sensation relative to the EIR. Both conditions experienced moderate levels of sensation. The ANOVA also yielded a three-way interaction of the treatment, gender, and repeated measures factors ($F(4,112)=2.97$, $p=.022$). An inspection of the daily treatment means revealed that, overall, the female IIR condition reported the highest level of textural sensation followed by the nearly equivalent reports of the male IIR and female EIR conditions with the male EIR reporting the lowest level of textural sensation.

(m) The ANOVA for item 19 (Difficulty following instructions?) revealed a main effect for the repeated measures factor ($F(4,112)=2.879$, $p=.025$). An inspection of the session means indicates notable daily fluctuations in subjects' ability to follow the audiotaped imagery rehearsal

instructions, however, none of the daily mean fluctuations approached even the 'moderate' level of difficulty.

(n) The ANOVA for item 20 (Number of imaginal darts per session?) indicated a main effect for the repeated measures factor ($F(4,112)=3.51$, $p=.009$). An inspection of the daily means reveals a steady increase in the number of imaginal darts thrown during the course of the five sessions from an initial level of 1-10 darts to final session level of 11-20 darts.

(o) The ANOVA for item 21 (Number of imaginal bullseyes?) indicated a main effect for the repeated measures factor ($F(4,112)=5.20$, $p=.000$). An inspection of the daily means reveals a steady increase in the number of bullseyes per session from an initial level of approximately 42% to a post-treatment level of approximately 61% of imaginal tosses scoring bullseyes, with a daily mean high occurring for session four of approximately 65%.

Post-Treatment Questionnaire Data

An Ullrich-Pitz ANOVA 2(Treatment) X 2(Gender) X 8(Item) was performed on the post-treatment questionnaire data. Significance was set at the .05 level alpha. All results were non-significant. Group means are given in Table 6.

Insert Table 6 about here

Response patterns suggest: generally clearer, more easily controlled imagery; increasing success with bullseye imagery; good to excellent motivation; and negligible to non-existent extra-session darts practice. Item means also suggest moderate levels of negative self-evaluation after imaginal dart misses, a highly positive response to the study, and few reports of dreams or daydreams regarding darts.

DISCUSSION

Results indicate that both the internal and external imaginal rehearsal treatment groups showed significant improvement from pre- to post-treatment, while the relaxation/attentional-placebo control condition did not. However, the statistical analysis also indicates that the post-treatment scores for all three conditions did not differ significantly. Inspection of the magnitude of change and percentage improvement scores suggest support for the hypotheses that: (a) the male internal IR subjects would outperform the male external IR group, and conversely, that (b) the female external IR condition would improve to a greater extent than the female internal IR group. And indeed, as predicted, in the case of the female subjects the external IR condition improved more than twice as much as their internal IR counterparts (20.5% to 8.9%). It should be noted, however, that this may be due in large part to initial differences in their baseline dart-accuracy scores, as their post-treatmhent scores were not significantly different. The male internal IR group, as predicted, outperformed the male external IR condition (13.7% to 9.1%); again the post-treatment scores do not differ significantly. Despite the observed trends, in the

predicted directions, in support of the stated hypotheses, in terms of our primary research questions and concomitant hypotheses, the results indicate: (a) lack of support for the proposition that the internal imagery perspective is a more effective method of enhancing dart-throwing accuracy (a "closed", precision perceptual-motor skill) vis a vis the external imagery perspective, (b) there appear to be differences in how men and women utilize the different imagery perspectives, but the observed trends in support of this position do not reach significance, and (c) though only the treatment groups improved significantly (relative to their baseline scores) pre- to post-treatment, the ANOVA indicated that there were no demonstrable differences in the three groups final performance levels which again indicates a lack of support for the primary research hypotheses.

(Less than) clearly the results do not support the predictions. There may be several reasons for this failure to disconfirm the null hypothesis. Foremost among these alternative explanations is the possibility that the treatment period was too abbreviated. Five one-half hour sessions may have provided too little imaginal rehearsal to adequately demonstrate potential between-group differences, especially in light of the fact that subjects were instructed <u>not</u> to practice outside of the sessions which is an artificial situation relative to the real-world of sport performance enhancement work. It should also be pointed out that the parameters delimiting the optimal effective practice and utilization of imaginal rehearsal are from standardized (Feltz and Landers, 1983). Extrapolating from graphs in Figure 3 it may be inferred

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Insert Figure 3 about here

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that with a protracted treatment period the observed trends (in the predicted directions) would continue on to significant levels. So, though the length of each IR session may have been appropriate (Twining, 1949; Feltz and Landers, 1983), the total number of sessions in the treatment period may need to be increased in future studies until a learning curve is established. Subjects expressed general satisfaction with the study, and reported increases in the number of imaginal darts thrown per IR session, and a concomitant increase in the number of imaginal bullseyes. Given the positive response to, and observed (and reported) high level of interest, attention, and motivation, it is quite possible that the subjects could have continued with their observed trends in improvement for another five sessions, and perhaps more, without feeling the boredom and monotony reported in other similar studies (Andre, 1985), or manifesting the reactive inhibition often seen in repetitive practice experimentation; this speculation awaits experimental confirmation.

Another possible mediating factor may have been the performance outcome (dart accuracy) measure itself (See Figure 1). Though the instrument (dartboard) designed for use in this study was an improvement over those used in similar studies (Mendoza and Wichman, 1978; Epstein, 1980), it still may not have been as sensitive as necessary. It was noted in the course of the dart-accuracy performance assessment periods that the

concentric circles (2.24cm apart) allowed a large measure of variation in accuracy within each scoring increment (ring). A score of '9' that was almost a '10' was not quantitatively different from a '9' that was almost an '8', even though it was in actuality a more accurately thrown dart, ergo, qualitatively superior. Doubling the number of concentric scoring rings would provide for a more fine-tuned and sensitive assessment of changes in dart-throwing accuracy, and, thus, enhance discriminability between conditions.

Practically speaking, this study found little that would substantively change the present application of imaginal rehearsal in the practice of psychological sport performance enhancement. It was initially predicted that women would be better off imaginally rehearsing a "closed" skill from an external IR perspective and men from an internal IR perspective; the data do not unequivocally support such a position. They do, however, provide evidence for the effectiveness of imaginal rehearsal as a sport performance enhancement technique. This study utilized a group of self-selected, highly athletic, sports-minded collegians who all possessed some familiarity with the dart-accuracy performance measure, possessed the requisite physical skills, and approached the study with a high degree of enthusiasm and motivation. The careful attention to subject characteristics and procedural variables increases the strength, utility, and generalizability of these findings to other athletic populations to a greater extent than would the use of a non-athletic or random sample.

Though speaking from a tenuous empirical base, practically and theoretically, this study does address several of the parameters of IR that are still in the process of delineation, i.e., optimal number of IR trials, "speed" of IR, increases or decreases in IR success, and controllability and clarity of IR. The practical implications of this study stem, not so much from a disconfirmation of the null hypothesis, but instead from the data derived from the manipulation checks-- and these implications are essentially in the form of questions to consider in applying IR procedures, rather than answers. These might be called "secondary findings and inferences of interest," and chief among these are that:

(1) The levels of relaxation achieved by the three groups were essentially equal. The three groups began at equivalent levels and progressed from there to deeper states. Given the inconclusive findings, it may be that the level of relaxation alone accounted for the observed improvement.

(2) Both of the imagery groups reported a significantly greater degree of dart-related imagery relative to the RAPC group. Though other studies have suggested that imaginal rehearsal with relaxation is superior to relaxation alone (Kolanay, 1977), the data from this study does not support such a position.

(3) It is interesting to note that while there was little increase in the clarity or control of the experienced imagery, there were significant increases in the number of darts thrown per IR session and in the percentage of those throws that were bullseyes (a

positive outcome suggested by the audiocassette). These findings become increasingly paradoxical when examined in relation to the finding that the subjectively perceived "speed" of the imagery rehearsal decelerated over the course of the five treatment sessions to the terminus where the reporting of any further "slowing" was delimited by the end of the Likert-scale, i.e., "Very Slow Motion Speed." The subjects reported rehearsing a continually growing number of imaginal dart-throws, with steadily increasing accuracy, at an increasingly decelerating "speed", but with no reported concomitant increases in control or clarity of the imagery. Other studies have indicated that increased controllability and clarity are associated with enhanced performance (Start and Richardson, 1964). Are these data corroboration or disconfirmation of this finding? With a continuation of this study would these related patterns have yielded different performance outcome levels? It should be noted that the three-minute "unguided" segment of the imaginal rehearsal session provides ample time for the tossing of 11-20 imaginal darts-- even those thrown at a "Very Slow Motion" rate of speed. This finding is less puzzling when it is recalled that, as with any self-report assessment of imagery, there is room for tremendous subjective variability in an individual's generation of, perception of, and responses to, mental imagery. There is also the possibility that this phenomenon is a function or epiphenomenon of a hypnoidal or self-hypnotic state which has given rise to a distinctive form of distorted time perception (Zimbardo, 1972, 1976); further research is required to either validate or disconfirm these speculations. It is also interesting to

speculate about the possible outcomes for studies which urge greater or slower "speed" of imagery in concert with a greater or lesser number of imaginal trials.

(4) Anxiety, locus-of-control, and previous task experience are all variables that have been shown to have an impact on the practice and efficacy of IR procedures. The SCAT and LOC measures were included to assess for potential between-group differences that might have mediated the results of the treatment. The analyses indicated no differences between-groups along these dimensions. It was hoped that correlational analyses would be possible to assess if either sport competition anxiety or locus-of-control differentially affected subjects' use of or benefit from the IR treatment procedures; however, the small sample size precluded such statistical analysis (N=48, n=8). Future studies might be designed with a sample size large enough to allow for just such a statistical investigation of the relationship between IR perspective, anxiety, LOC, and performance.

(5) These data strongly suggest that five days worth of half-hour sessions (PP/MP/PP/manipulation check) does not allow enough time in actual IR to permit the emergence/development of a coherent and salient IR process. The implication here is that at least two weeks would be a more optimal period in which to develop an IR routine and perhaps to assess for potential differences in performance enhancement capability.

Procedurally and methodologically, this study provided for some distinct improvements over past studies in this area. Attention to temporal and procedural variables has allowed for greater latitude in interpretation of the results than has been possible in past studies (Epstein, 1980; Mendoza and Wichman, 1978). Attention to both subject and task characteristics has minimized confounding by these factors. This is not to say that this study could not be improved upon. The following suggestions for future refinements of the paradigm are proferred:

(1) This study sought to examine the effects of the two imaginal rehearsal (IR) perspectives on subsequent performance, and was designed with this assumption in mind, i.e., two perspectives. This study did not, however, make provisions for the assessment of possible alternative perspectives, e.g., a combined, simultaneous imaginal experience from both perspectives. In fact, the experience of a simultaneous "subject-object" perspective is a distinct possibility. Several of the subjects reported experiences during IR that they had "no words to describe." One said, "It was like I could see myself throwing the dart, and at the same time I could feel myself throwing it." This simultaneous dual-perspective experience was not reported as being in the least disconcerting or unnatural, although at first the subject tried to make her imagery conform to the audiotaped instructional set. This study was premised on the Mahoney and Avener (1977) internal-external dichotomy, in future studies it would be an excellent idea to assess "proportion of internal to external perspective" in more

exacting manner than the Likert-scaled manipulation check items utilized in this study.

(2) After conducting this study and observing the entire process it seems that between-groups designs, like the one employed in this study, may not be the optimal strategies for approaching this question. In the future investigators might consider using single-subject or blocked designs with intensive screening procedures to identify subjects/athletes with the specific IR characteristics, and then run a comparable study to assess the relative value of IR from the naturally occurring (see Introduction) perspectives relative to 'mandated' IR orientations. The inclusion of a personality measure should be considered as well.

(3) Epstein (1980) reported on the phenomenon of "switching," i.e, the changing of perspective during an imagery experience, such as imagery rehearsal. She made the comment in her discussion of the concept of imaginal style that "...it was virtually impossible to characterize subjects as strictly internal or external imagers because individuals' images varied considerably both within and between images." (p.218). The present study made no provision for the assessment of the nature of the switching experienced by the subjects. The presence, absence, and degree of switching was assessed, but the subjects were not queried about: (a) when it occurred, (b) under what circumstances it occurred, (c) at what juncture in the IR session, (d) the possibility of particular patterns or recurrences, or (e) changes in the phenomenon over the

course of treatment. It would seem nonetheless that the notion of stable and polarized imaginal perspectives is not supported by this data, as was the case with Epstein (1980). Personal experience as an athlete, and sport performance enhancement work with athletes, has taught me that switching is a very subjective and capricious phenomenon. It can be posited that the occurrence of switching may be linked to the nature of the task ("closed" vs "open"), possible changes in the cognitive or affective (information processing) demands inhering in the execution of a given skill during performance or practice, and possibly to changes in perceptions of self-efficacy during skill performance. In other words, the dynamic and multimodal nature of the imaginal rehearsal experience may well depend not only on the personality (especially degree of skill-specific self-efficacy) of the imaginal rehearser, but her experience with the rehearsal task, and the requirements and features inherent in the performance of the skill as well. Future inqueries into the internal-external question would be well-advised to investigate and assess these possibilities.

The theoretical implications of this study are limited in scope. As stated in the literature review, this author subscribes to the attentional-arousal set (AAS) explanation for the performance facilitating effects of IR. However, this study was not specifically designed to assess the relative efficacy of the competing explanations of IR effectiveness. It was instead designed to investigate the effects of (essentially) IR from either of the 'mandated' imagery orientations. Given the limited allotted IR (optimal) time period this procedure chose

to focus on 'holding' the subjects in their assigned perspectives, rather than emphasizing an instructional set conforming to a specific theory of IR. This was, in essence, an applied study. That is not to say it was atheoretical. But given these disclaimers, qualifiers, and the aforementioned inconclusive results of this study, it would be, perhaps, premature to discuss which theory this data might support in any repeatable, observable, or testable way. The data do, however, merit some explorative discussion regarding their pertinence to the attentional-arousal set theory of IR. This support is indicated in the finding that subjects increased their rates of imaginal success to an extent far exceeding their actual physical performances. This can be interpreted more as speaking against the neuromuscular feedback (NF) and cognitive-motor (CM) hypotheses than for the AAS explanation. How so? The NF hypothesis infers that IR strengthens the efference patterns of a given task by activating the proper neuromuscular sites repeatedly; it follows that proper imaginal rehearsal will lead to enhanced physical performance. The data from the present study suggest that the subjects were, by and large, unable to control or achieve any high degree of clarity during IR, but did experience an increase in their rates of reported successes, darts tossed, and a slowing of the "speed" of their practice; all of which speaks against the notion of IR providing a template for the refinement of the actual physical performance. The data also suggest that it is not the rehearsal of the cognitive elements inhering in the task that produced the demonstrated improvement, but instead it was the experiencing of a relaxed, affectively-pleasing state of mind "where anything positive is possible" that fostered the performance increment. What this suggests is that it is the

attentional-arousal setting aspects of IR that are important, but more importantly is that it may be the case that it was the subjects' increased feelings of self-efficacy that led to their increases in imaginal success rather than simply a change in attentional-arousal set.

In conclusion, it would appear that this study has asked many questions and provided only limited answers; the internal-external question is far from resolved. Perhaps the idea of polarized perspective extremes was an oversimplification of a complex phenomenon and that future studies will have to be more flexible in attempting assessment and modification of IR perspective. It would appear that there may be gender, and skill ability differences in IR use and benefit, but the parameters of this relationship are as yet poorly defined. Given these findings and those of Mahoney and Avener (1977) one might suspect that the degree of self-efficacy might mediate this relationship given that many athletes of the highest caliber seem to gravitate naturally towards an internal perspective; however, other studies suggest that there is more involved than simply "feelings of confidence." Future studies may reveal whether "mandated perspective" IR practice can yield differential enhanced performance across gender and ability level; the present data only hint at such a possibility. The present study fulfilled its mission in that it expanded upon and extended the work begun by Epstein (1980) in a manner that substantively enriches our understanding of imaginal rehearsal.

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TABLES AND FIGURES

TABLE 1

Imagery Questionnaire Item Means

ORANGE

	INTERNAL		EXTERNAL		RAPC	
	Male	Female	Male	Female	Male	Female
1.**	5.62	6.37	5.50	6.25	5.00	6.00
2.**	2.50	3.37	2.50	4.37	2.50	3.50
3.**	3.62	5.37	2.25	4.87	2.75	4.25
4.**	4.25	5.25	4.37	5.37	4.37	5.62
5.	3.87	4.75	4.12	3.50	3.25	3.37
6.	2.62	2.37	3.37	2.62	3.37	3.00
7.	2.75	2.12	2.50	2.75	2.87	2.50
8.	5.25	5.75	4.12	5.62	4.00	4.12
9.	6.12	5.75	6.62	5.12	6.75	6.25
10.	3.25	1.87	2.50	4.00	3.25	3.00
11.	5.00	5.00	4.87	4.25	4.75	4.50
12.	1.62	2.00	1.75	3.00	1.50	1.62
13.	5.75	6.25	5.00	4.50	4.75	5.37

** Significant at the .05 level alpha (female subjects > male subjects).

TABLE 1 (Continued)

Imagery Questionnaire Item Means

TELEPHONE

	Internal		External		RAPC	
	Male	Female	Male	Female	Male	Female
1.	5.62	6.12	6.12	6.12	5.87	6.12
2.	5.75	5.62	5.62	6.00	5.62	5.50
3.	2.50	2.25	2.25	1.25	1.25	1.00
4.	3.75	5.87	5.37	5.12	5.25	5.50
5.	5.12	5.12	5.37	5.00	3.75	4.87
6.	2.37	2.12	2.50	2.50	2.37	2.25
7.	2.25	1.75	2.37	2.25	2.12	1.75
8.	5.62	6.25	6.00	5.75	4.75	5.37
9.	5.62	4.00	5.62	5.12	5.50	6.00
10.	3.50	2.87	3.25	2.87	2.25	3.62
11.	5.25	5.87	5.25	5.62	5.87	5.62
12.	3.12	3.25	4.37	3.37	2.62	1.62
13.	4.87	5.50	4.37	5.12	5.75	5.62

TABLE 1(Continued)

Imagery Questionnaire Item Means

ELEVATOR

	Internal		External		RAPC	
	Male	Female	Male	Female	Male	Female
1.	4.25	5.75	6.12	5.87	5.62	5.75
2.	4.25	5.00	4.37	5.12	4.37	4.87
3	2.37	2.25	1.12	1.62	1.25	2.50
4.	2.00	3.00	3.50	2.50	2.50	3.50
5.	3.87	4.00	4.25	4.12	3.75	4.37
6.	3.37	2.37	2.50	2.75	3.12	2.37
7.	4.00	2.75	2.25	2.75	2.62	3.25
8.	3.37	5.12	4.87	5.75	3.12	5.25
9.	2.25	2.00	2.37	1.87	3.62	2.50
10.	4.37	3.62	4.25	4.37	3.62	3.87
11.	4.12	5.62	3.62	4.37	4.75	4.25
12.	3.25	4.25	3.50	3.50	2.50	3.00
13.	4.12	5.12	3.50	4.37	4.50	5.00

TABLE 1(Continued)

Imagery Questionnaire Item Means

FRISBEE

	INTERNAL		EXTERNAL		RAPC	
	Male	Female	Male	Female	Male	Female
1.**	5.75	6.12	5.62	6.37	5.25	6.37
2.	3.62	3.12	4.12	5.25	3.50	4.62
3.**	2.50	3.75	2.12	3.87	3.50	4.62
4.	4.75	5.62	5.75	5.87	4.62	5.75
5.	5.37	5.62	6.12	6.37	5.12	5.50
6.	2.75	2.50	2.75	2.37	3.25	2.50
7.	2.12	2.62	2.75	2.50	2.87	2.00
8.	5.75	5.75	6.62	6.62	6.00	5.12
9.	2.25	2.37	2.00	1.12	3.75	2.62
10.	3.62	2.62	3.75	4.25	3.12	4.75
11.	3.87	5.25	4.25	4.12	4.87	5.00
12.	4.00	3.75	3.37	4.00	2.25	2.50
13.	3.37	5.37	4.00	3.75	5.37	4.12

** Significant at the .05 level alpha (female subjects > male subjects).

TABLE 2

Sports Experience Questionnaire Item Means

	Questions	IIG	EIG	RAPC
(1a)	Number of sports played?	6.00	6.37	6.31
(1b)	Cumulative total of years in sport?	24.62	29.25	36.12
(2)	Attitude towards darts?	4.81	4.25	4.50
(3)	Number of times played darts?	3.31	3.50	3.06
(4)	Percent improvement? (Likert)	3.81	3.93	3.75
(5)	Self-confidence at darts?	3.81	3.37	3.81
(6)	How skilled at darts?	3.75	3.18	3.31
(7)	Number of bullseyes out of 50?	5.06	4.93	6.56
(8)	Most bullseyes out of 50?	9.06	9.06	10.0
(9)	Least bullseyes out of 50?	1.87	1.43	2.06
(10)	How nervous are you?	3.68	3.12	2.43
(11)	Percent improvement? (%)	42.43	37.62	41.87
		** (Males= 46.83	Females= 34.45)	
(15)	How motivated are you?	5.50	5.50	6.06

Items 1a, 1b, 7, 8, 9, and 11 are non-Likert-scaled questions, with items 12, 13, 14, and 16 being free-response and discussed in the Results.

** Significant main effect for the gender factor at the .05 level alpha. All other results were non-significant (NS).

TABLE 3

Sport Competition Anxiety Test (SCAT) and Rotter's Internal-External Locus-of-Control Scale (LOC) Group Means

		**SCAT	**LOC
Internal IR	(Males)	23.00	9.75
	(Females)	22.25	10.25
External IR	(Males)	22.38	9.50
	(Females)	21.25	12.63
Relaxation/ APC	(Males)	21.38	11.50
	(Females)	22.50	11.38

** All group means are non-significant (NS) at the .05 level alpha.

TABLE 4

Group Percentage Improvement and Change Scores

		Percentage Improvement	Change Scores
Internal IR	(Males)	13.7%	.845
	(Females)	8.9%	.460
External IR	(Males)	9.1%	.560
	(Females)	20.5%	.948
Relaxation/ APC	(Males)	1.8%	.115
	(Females)	4.4%	.225

TABLE 5

Common Manipulation Check Item Group Means

	Questions	IIG	EIG	RAPC
(1)*	How relaxed did the tape make you feel today?	5.95	5.80	5.22
(2)*	Did you experience any images related to darts while listening to the tape today?	4.80	4.53	1.79
(3)*	Do you believe this program will be beneficial to you in any way?	5.56	5.23	5.04
(4)*	Do you think this training program will assist you in becoming a better darts-player?	5.13	4.89	4.21

* The ANOVA's for each of the four items were significant at the .05 level alpha. See Results section for specific significant main effects.

TABLE 6

Manipulation Check Questionnaire Item Means for the Imagery Rehearsal Treatment Groups

	Questions	IIG		EIG	
		Men	Women	Men	Women
1)	How relaxed did the tape make you feel today?	6.10	5.80	5.55	6.05
2)	Were you able to relax more completely than yesterday?	4.67	4.87	4.82	4.90
3)	How motivated were you to practice today?	4.85	5.15	4.70	4.87
4)	How clear or "real" was your imagery darts practice session today?	4.97	4.90	4.77	4.85
5)	Did you experience any images related to darts today while listening to the tape?	4.55	5.05	4.72	4.35
6)	How vivid were these images?	4.82	5.05	4.65	4.47
7)	Were you able to control these images?	4.85	4.92	4.57	4.72
8)	Did you switch "perspective" today ?	2.85	2.75	3.00	3.40
9)	From what "perspective" did you visualize these images?	5.47	5.32	2.77	3.45
10)	Were you able to maintain and control the prescribed "perspective"?	5.07	4.97	4.77	5.07
11)	Did you experience any particular feelings of bodily movement or physical sensations today?	4.07	4.72	3.52	4.40

(12)	How intense were these sensations?	3.65	4.57	3.00	4.10
(13)	Control of physical sensations?	4.47	4.70	4.17	4.55
(14)	"Speed" of mental imagery?	5.27	5.62	5.30	5.52
(15)	Do you believe this program will be beneficial to you in any way?	5.32	5.80	5.20	5.27
(16)	Do you think this training program will assist you in becoming at better darts player?	5.27	5.00	4.90	4.87
(17)	Did your imagery contain any sounds?	3.17	3.57	2.82	3.25
(18)	Were you able to "feel" the darts during the imagery session?	3.92	4.37	2.60	3.42
(19)	Able to follow the instructions easily?	2.80	3.10	3.17	2.67
(20)	How many darts did you throw during your imagery session today?	3.10	3.55	3.12	3.35
(21)	How many of the tosses were bullseyes?	3.95	4.10	4.17	4.47
(22)	Dreams or daydreams about darts?	.225	.150	.150	.225
(25)	Practice outside of the sessions?	-0-	-0-	-0-	-0-

** Questions 23 and 24 were free-response items.

TABLE 7

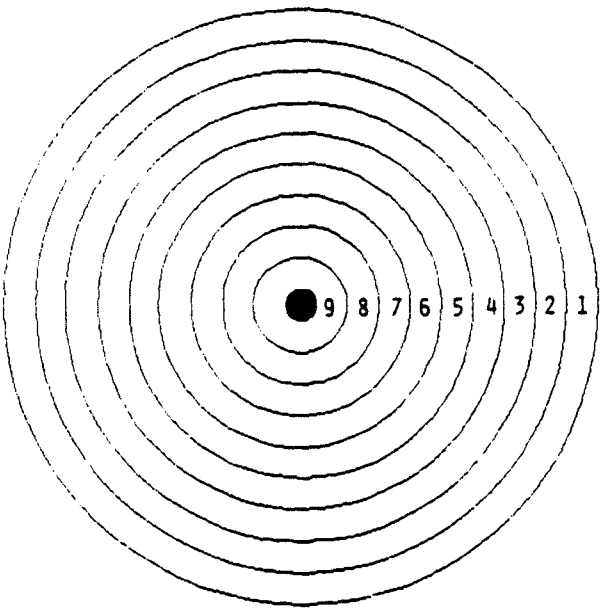
Post-Treatment Questionnaire Item Means for the Imagery Rehearsal Treatment Groups

	Questions	IIG	EIG
(1)	Increased clarity of dart imagery?	5.43	5.50
(2)	Increased ease of imagery control?	5.37	5.12
(3)	Increase in successful imaginal dart-throws?	4.81	5.00
(4)	How would you rate your motivation?	5.75	5.25
(5)	Practice in the past seven days? (Yes=1 No=0)	.13	.25
(6)	Negative evaluation of self after misses?	2.94	3.81
(12)	Did you enjoy participating in this study?	5.75	6.06
(13)	Dreams or daydreams of darts? (Yes=1 No=0)	.25	.31

Questions 7, 8, 9, 10, 11, and 14 were free-response items.

All post-treatment questionnaire items were non-significant.

FIGURE 1



(Dartboard (42.5cm in diameter) was bright yellow with a solid black bullseye (2.23cm in diameter) and nine high-contrast blue rings approximately 2.23cm apart and numbered one through nine (1-9) as illustrated above. Board was hung per standard measurements set by the World Darts Federation. Dimensions are given in Figure 1a below.)

Figure 1a

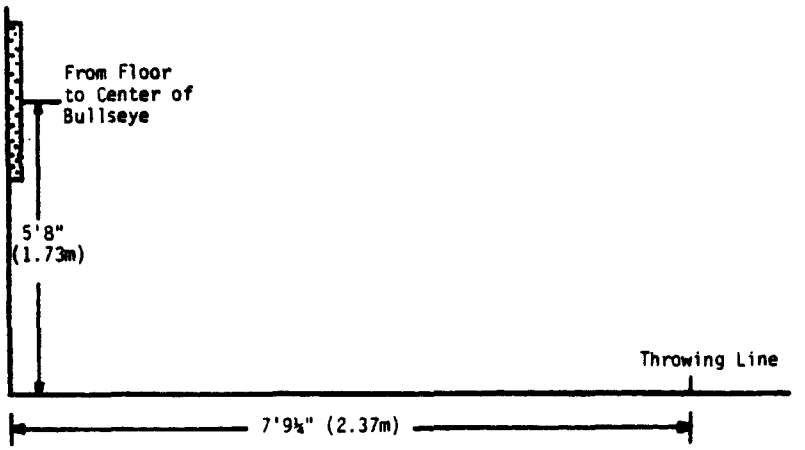


Figure 2

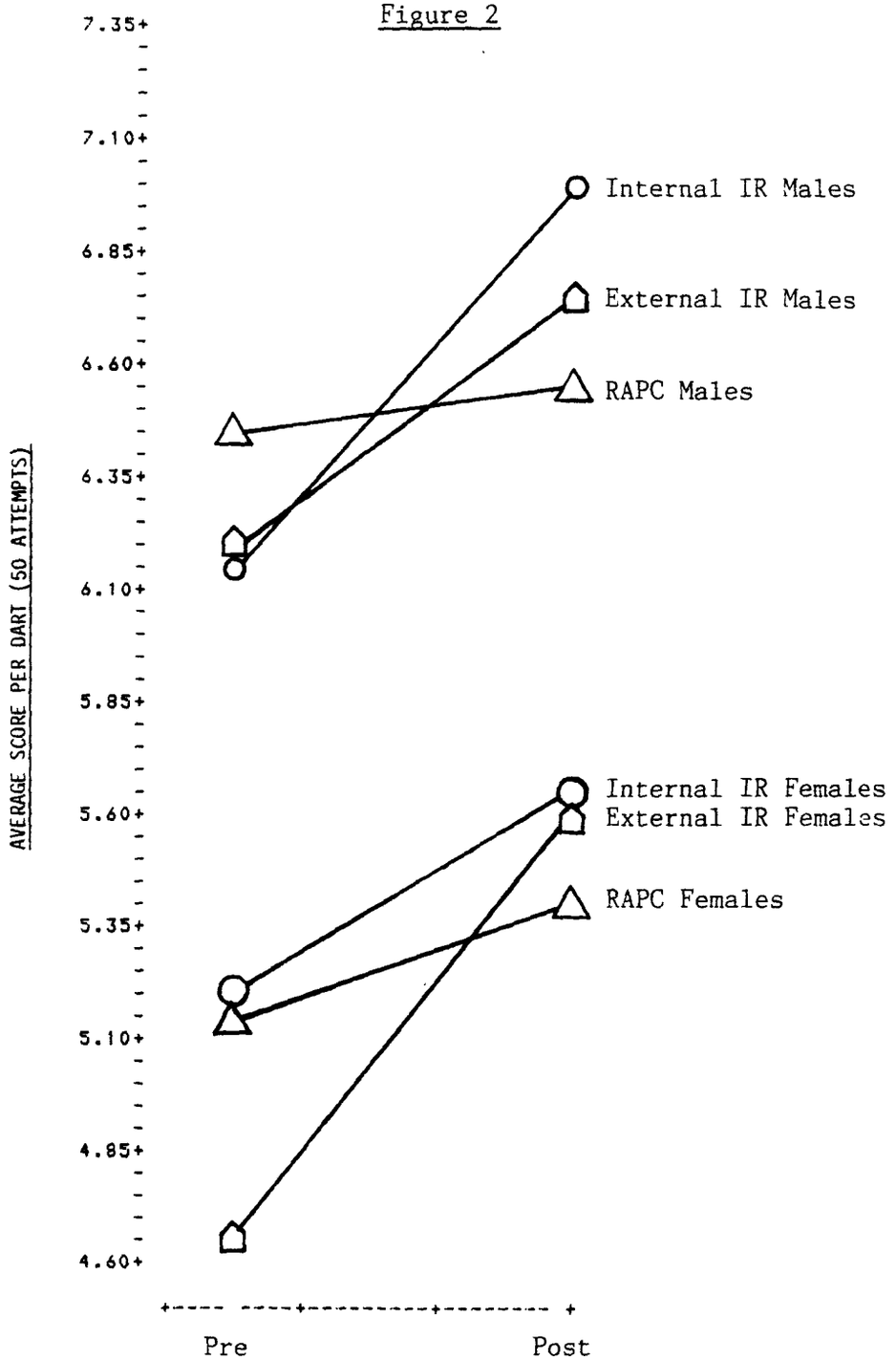

AVERAGE SCORE PER DART (50 ATTEMPTS)
7.35+
7.10+
6.85+
6.60+
6.35+
6.10+
5.85+
5.60+
5.35+
5.10+
4.85+
4.60+
Internal IR Males
External IR Males
RAPC Males
Internal IR Females
External IR Females
RAPC Females
Pre
Post

Figure 3

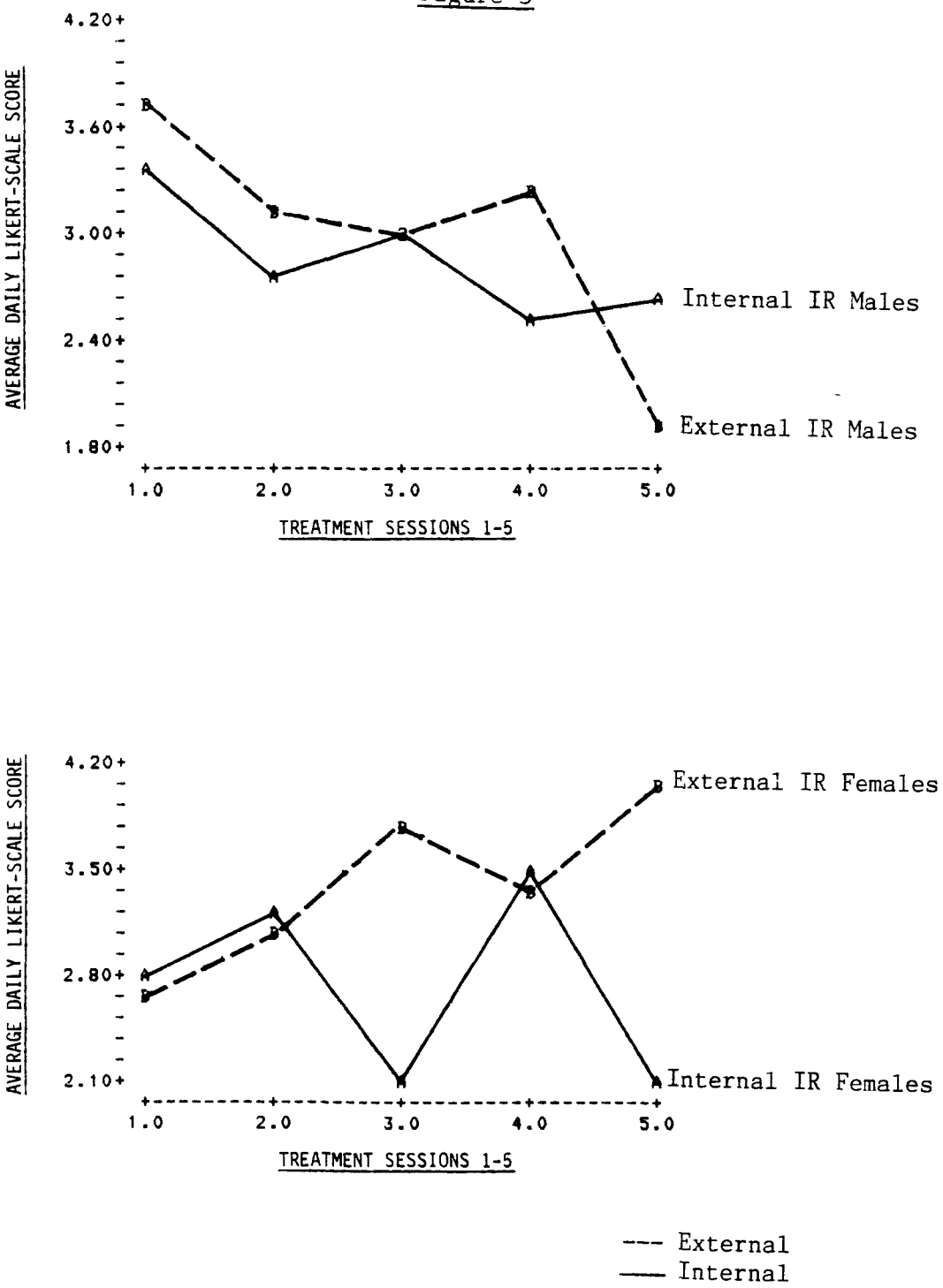

AVERAGE DAILY LIKERT-SCALE SCORE
4.20+
3.60+
3.00+
2.40+
1.80+
1.0
2.0
3.0
4.0
5.0
TREATMENT SESSIONS 1-5
Internal IR Males
External IR Males
AVERAGE DAILY LIKERT-SCALE SCORE
4.20+
3.50+
2.80+
2.10+
1.0
2.0
3.0
4.0
5.0
TREATMENT SESSIONS 1-5
External IR Females
Internal IR Females
--- External
—— Internal

Figure 4

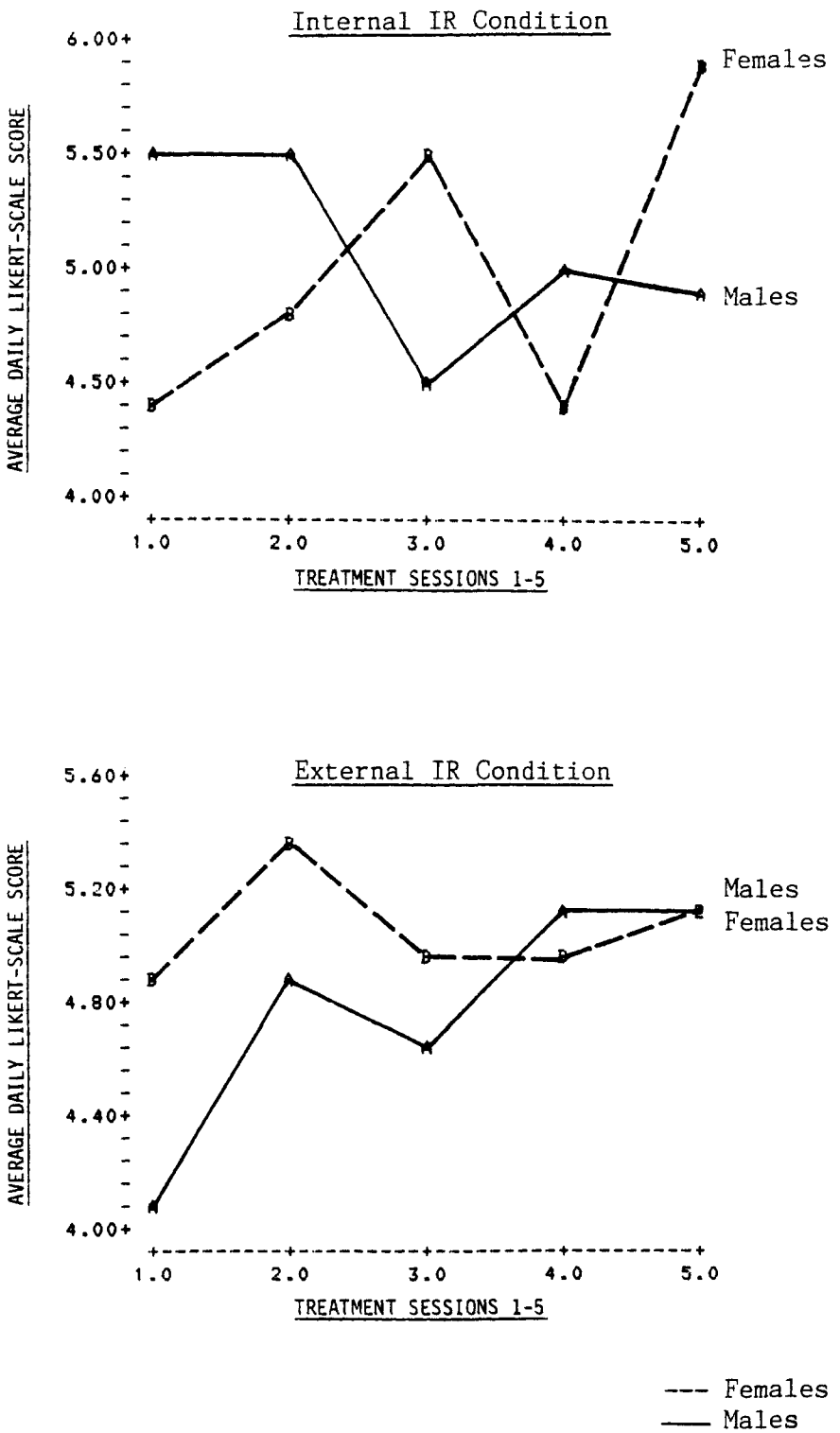

Internal IR Condition
AVERAGE DAILY LIKERT-SCALE SCORE
6.00+
5.50+
5.00+
4.50+
4.00+
Females
Males
1.0
2.0
3.0
4.0
5.0
TREATMENT SESSIONS 1-5
External IR Condition
AVERAGE DAILY LIKERT-SCALE SCORE
5.60+
5.20+
4.80+
4.40+
4.00+
Males
Females
1.0
2.0
3.0
4.0
5.0
TREATMENT SESSIONS 1-5
--- Females
—— Males

Figure 5

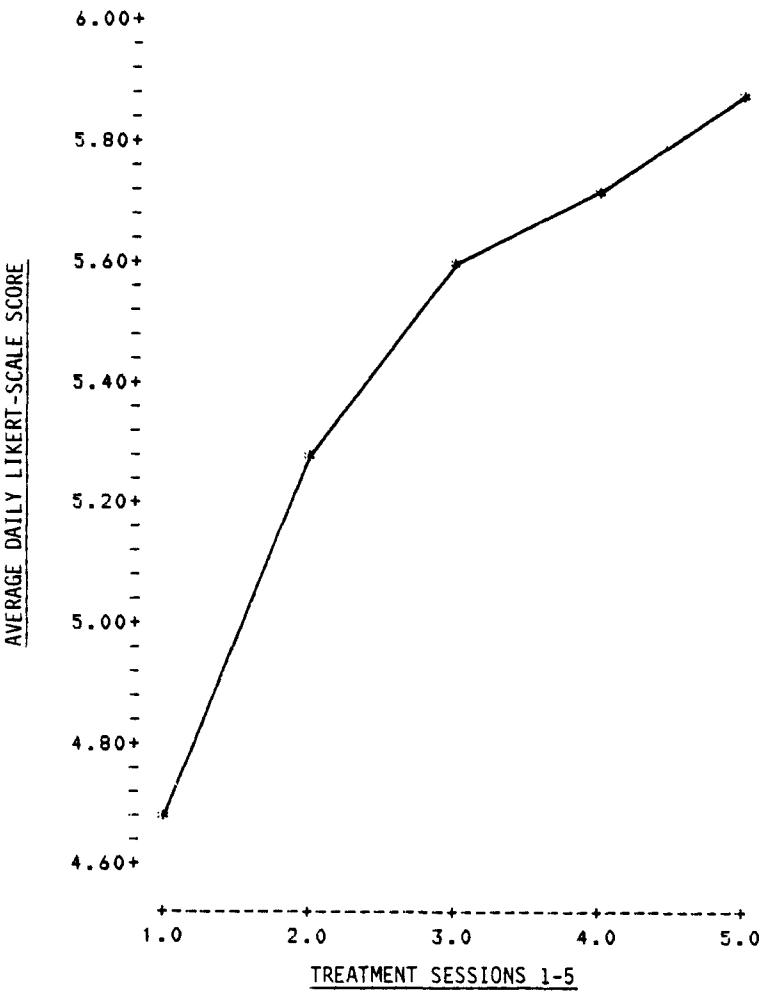

6.00+
5.80+
5.60+
5.40+
5.20+
5.00+
4.80+
4.60+
AVERAGE DAILY LIKERT-SCALE SCORE
1.0
2.0
3.0
4.0
5.0
TREATMENT SESSIONS 1-5

Figure 6

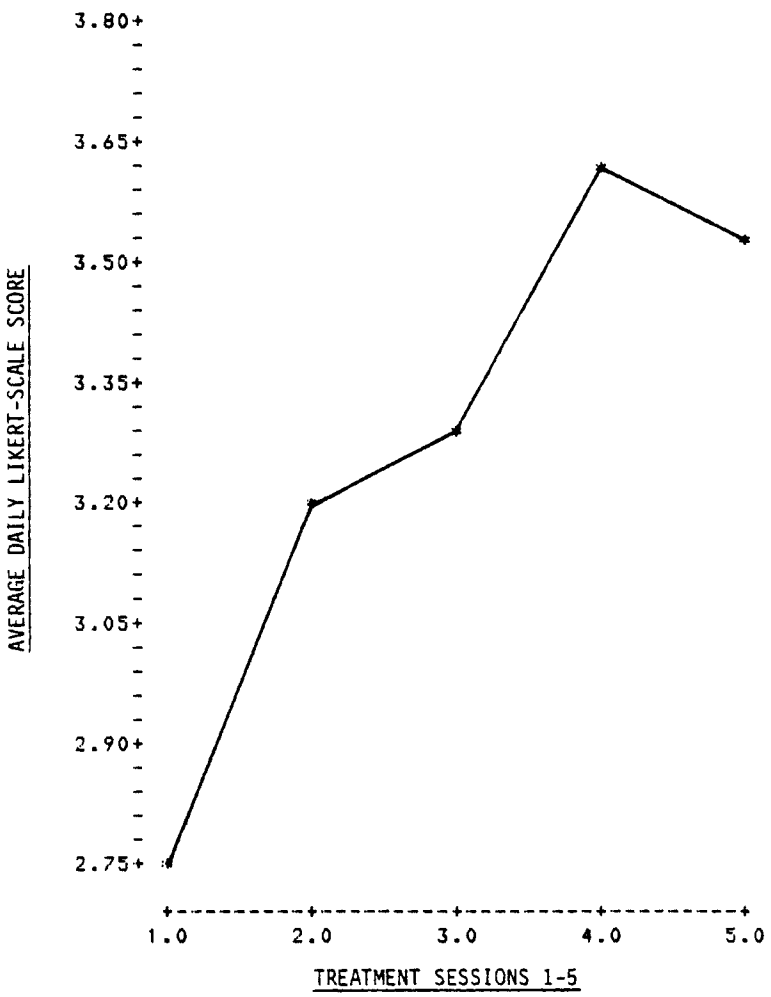
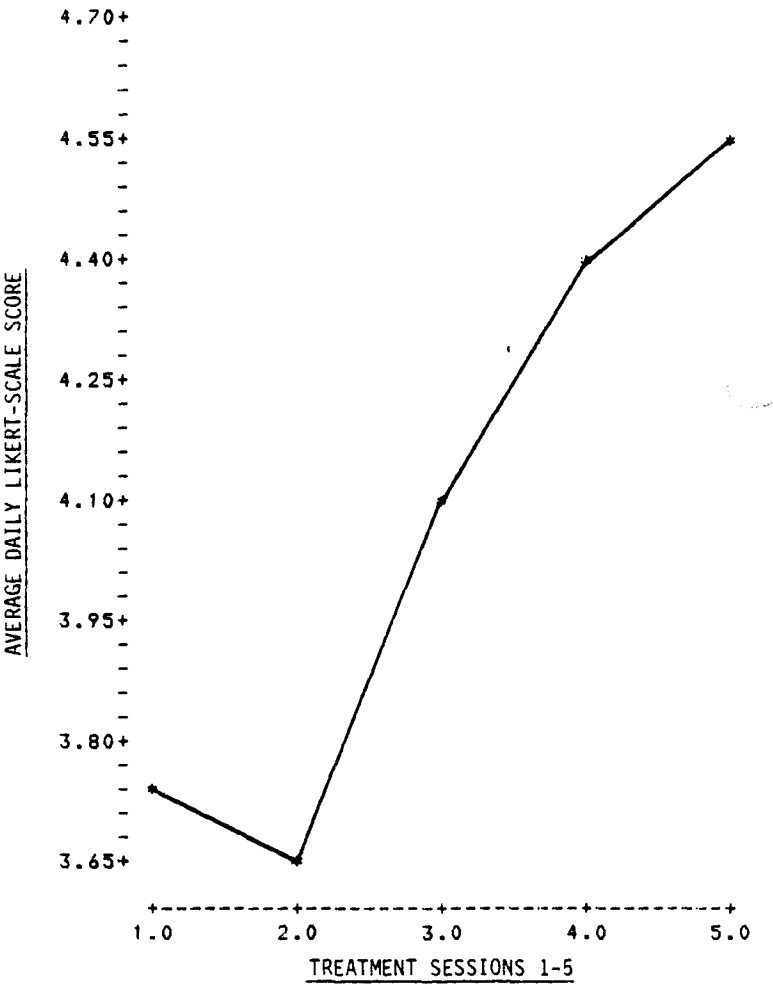

3.80+
3.65+
3.50+
3.35+
3.20+
3.05+
2.90+
2.75+
AVERAGE DAILY LIKERT-SCALE SCORE
1.0
2.0
3.0
4.0
5.0
TREATMENT SESSIONS 1-5

Figure 7


4.70+
4.55+
4.40+
4.25+
4.10+
3.95+
3.80+
3.65+
AVERAGE DAILY LIKERT-SCALE SCORE
1.0
2.0
3.0
4.0
5.0
TREATMENT SESSIONS 1-5

APPENDIX A

Enhanced Sport Performance Study Appointment Form

Enhanced Sport Performance Study

My appointment is for April _____, from _____ to _____ at the Clinical Psychology Center, 1444 Helena Avenue. This study meets for 20-30 minutes at the arranged time each evening during the week of April 8-12, and for 30 minutes next Saturday, April 13, or Sunday, April 14 (exact times to be arranged). I understand that I am obligated to attend all sessions to receive the nine (9) credits for this experiment, plus a one credit bonus for prompt, punctual, and regular attendance at all sessions.

Joseph Biron
Study Coordinator

APPENDIX B

Pre-Treatment Instructions

Thank you for coming today, my name is (experimenter's name), and this is (assistant's name). The title of this study is Enhanced Sports Performance and I'd like to take a moment to see if everyone is here and learn your names. (Take roll.) You've been asked to come here for the purpose of training to improve your general sports ability. This study will require your cooperation and attendance for the period of one week and in return you will receive experimental credit commensurate with your participation. Please read along with me as we go over the contract you have just been handed. (Pass around contract, see Appendix C). Now that we all understand what is required let us proceed.

We are now going to complete a short procedure to assess your relaxation and imagery abilities. Please listen closely while the instructions are read aloud. (See Appendix G.)

Now I have three short questionnaires for you to complete (Appendices D, E, and F). (Pass out questionnaires, let them complete them, collect them.)

I would now ask you to watch closely the following instructional videocassette which demonstrates a technically correct technique for dart throwing. Please pay close attention to this tape and notice the following things: the centered, balanced stance, the feet parallel to each other with the right foot slightly in front of the left (correct for left-handed shooters), knees slightly flexed, thrower bending forward slightly, flexing at the waist, positioned in the middle of the line. Notice as the demonstrator brings the dart up and prepares to throw he pauses momentarily--focusing on

the target. As he begins the shot notice how his shooting arm flexes and straightens--his hand "waving" and pointing towards the dartboard in a slightly prolonged follow-through. This style of throwing darts will be demonstrated three (3) times.

At the end of this sequence we will move to the dartboard area where you will practice this shot a few times to get warmed-up; after which you will then attempt this shot a number of times. Please watch the video closely. (Run videocassette.) Now let's move to the dartboard area. (Move to the dartboard area.) Here are the darts you will be using (hand five, 5, darts to subject). Now take five (5) practice shots from this line using the style you feel most comfortable with. We will retrieve the darts. (Record warm-up scores, see Appendix M). Okay. The procedure we will be using for the rest of the throws will be as follows: shoot five (5) darts and then step away from the line and pause for a moment (10 seconds) and then step back to the line and shoot five (5) more throws. Repeat this process until you have attempted twenty-five (25) shots. At this point you will break for one (1) minute and then return to the line for another twenty-five (25) attempts in the aforementioned fashion. Are there any questions? We will begin when you are ready. Shoot at a pace that you are comfortable with. Take your time and do the <u>very best</u> you can. Do you have any questions? Okay. Begin when you are ready. (Record the results of all attempts on the DT Scoring Sheet, see Appendix M).

(Once the subject has completed the fifty, 50, attempts) Okay. That will be all for today. It was readily apparent that you were

involved and doing the best that you would and we appreciate your effort. (Hand out questionnaire.) I would like to again mention the fact that this study will be taking place over the course of this coming week. You have now contracted for a full nine (9) credits and a one (1) credit bonus for no missed sessions. Here is a sign-up sheet where you can schedule the daily times you'll be coming this week. Please remember to be prompt for your scheduled time; it is important so that the session can begin and end on time. These daily sessions will take approximately 20-30 minutes and should prove to be interesting and fun. In addition to these five (5) daily sessions there will be one (1) short additional session next Saturday or Sunday depending on your schedule. That will wind up the study and you will receive the credits you've contracted for. At that time you will have earned a full ten (10) credits, counting the bonus, and will be a better person (with a smile) for the experience. Any questions? Thanks for your attendance today. We appreciate your enthusiasm and look forward to working with you during the coming week. (Ensure a complete schedule for the week and then dismiss the subject.)

APPENDIX C

Participation Agreement

Participation Agreement

I, _____, hereby agree to attend (and participate to the best of my ability) each of the seven (7) sessions of the study, Enhanced Sports Performance, in exchange for nine (9) units of experimental credit. I further understand that if I fail to fulfill this contractual obligation I will be required to make up twice the number of units that I miss. I am also aware that if I attend all the sessions I schedule for I will receive a one (1) unit bonus. I also understand that this study is of a confidential nature and that it is important that I not discuss it with anyone until its completion. By the same token the experimenter will not discuss the specifics of my participation (i.e., breech of confidentiality) with anyone not affiliated with the experiment.

_____
Experimental Participant

_____
Study Coordinator

_____
Date

APPENDIX D

Sport Competition Anxiety Test

DIRECTIONS: Below are some statements about how persons feel when they compete in sports and games. Read each statement and decide if you HARDLY EVER, or SOMETIMES, or OFTEN feel this way when you compete in sports and games. Place an "X" at the appropriate place on the line below each item to indicate that you HARDLY EVER, SOMETIMES, or OFTEN feel this way. There are no right or wrong answers. Do not spend too much time on any one statement. Remember to choose the word that describes how you usually feel when competing in sports and games.

1. Competing against others is socially enjoyable.

   _____:_____:_____
   Hardly Ever Sometimes Often

2. Before I compete I feel uneasy.

   _____:_____:_____
   Hardly Ever Sometimes Often

3. Before I compete I worry about not performing well.

   _____:_____:_____
   Hardly Ever Sometimes Often

4. I am a good sportsman when I compete.

   _____:_____:_____
   Hardly Ever Sometimes Often

5. When I compete I worry about making mistakes.

   _____:_____:_____
   Hardly Ever Sometimes Often

6. Before I compete I am calm.

   _____:_____:_____
   Hardly Ever Sometimes Often

7. Setting a goal is important when competing.

   _____:_____:_____
   Hardly Ever Sometimes Often

8. Before I compete I get a queasy feeling in my stomach.

   _____:_____:_____
   Hardly Ever Sometimes Often

9. Just before competing I notice my heart beats faster than usual.

   _____:_____:_____
   Hardly Ever Sometimes Often

10. I like to compete in games that demand considerable physical energy.

    _____:_____:_____
    Hardly Ever Sometimes Often

11. Before I compete I feel relaxed.

_____:_____:_____
Hardly Ever Sometimes Often

12. Before I compete I feel nervous.

_____:_____:_____
Hardly Ever Sometimes Often

13. Team sports are more exciting than individual sports.

_____:_____:_____
Hardly Ever Sometimes Often

14. I get nervous wanting to start the game.

_____:_____:_____
Hardly Ever Sometimes Often

15. Before I compete I usually get up tight.

_____:_____:_____
Hardly Ever Sometimes Often

APPENDIX E

Rotter's (1966) Internal-External Locus of Control Scale

Instructions

This is a questionnaire to find out the way in which certain important events in our society affect different people. Each item consists of a pair of alternatives lettered a or b. Please select the one statement of each pair (and only one) which you more strongly believe to be the case as far as you're concerned. Be sure to select the one you actually believe to be more true rather than the one you think you should choose or the one you would like to be true. This is a measure of personal belief; obviously there are no right or wrong answers.

Please answer these items carefully but do not spend too much time on any one item. Be sure to find an answer for every choice.

In some instances you may discover that you believe both statements or neither one. In such cases, be sure to select the one you more strongly believe to be the case as far as you're concerned. Also try to respond to each items independently when making your choice; do not be influenced by your previous choices.

DIRECTIONS: There are 29 pairs of items on the page below. Read each pair of items and then circle the member of each pair with which you are more in agreement.

1. a. Children get into trouble because their parents punish them too much.
   b. The trouble with most children nowadays is that their parents are too easy with them.

2. a. Many of the unhappy things in people's lives are partly due to bad luck.
   b. People's misfortunes result from the mistakes they make.

3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.
   b. There will always be wars, no matter how hard people try to prevent them.

4. a. In the long run people get the respect they deserve in this world.
   b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.

5. a. The idea that teachers are unfair to students is nonsense.
   b. Most students don't realize the extent to which their grades are influenced by accidental happenings.

6. a. Without the right breaks one cannot be an effective leader.
   b. Capable people who fail to become leaders have not taken advantage of their opportunities.

7. a. No matter how hard you try some people just don't like you.
   b. People who can't get others to like them don't understand how to get along with others.

8. a. Heredity plays the major role in determining one's personality.
   b. It is one's experiences in life which determine what they're like.

9. a. I have often found that what is going to happen will happen.
   b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

10. a. In the case of the well prepared student there is rarely if ever such a thing as an unfair test.
    b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

11. a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
    b. Getting a good job depends mainly on being in the right place at the right time.

12. a. The average citizen can have an influence in government decisions.
    b. This world is run by the few people in power, and there is not much the little guy can do about it.

13. a. When I make plans, I am almost certain that I can make them work.
    b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14. a. There are certain peole who are just no good.
    b. There is a little good in everybody.

15. a. In my case getting what I want has little or nothing to do with luck.
    b. Many times we might just as well decide what to do by flipping a coin.

16. a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
    b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.

17. a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
    b. By taking an active part in political and social affairs the people can control world events.

18. a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
    b. There is really no such thing as "luck".

19. a. One should always be willing to admit mistakes.
    b. It is usually best to cover up one's mistakes.

20. a. It is hard to know whether or not a person really likes you.
    b. How many friends you have depends upon how nice a person you are.

21. a. In the long run the bad things that happen to us are balanced by the good ones.
    b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22. a. With enough effort we can wipe out political corruption.
    b. It is difficult for people to have much control over the things politicians do in office.

23. a. Sometimes I can't understand how teachers arrive at the grades they give.
    b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expect people to decide for themselves what they should do.
    b. A good leader makes it clear to everybody what their jobs are.

25. a. Many times I feel that I have little influence over the things that happen to me.
    b. It is impossible for me to believe that chance or luck plays an important role in my life.

26. a. People are lonely because they don't try to be friendly.
    b. There's not much use in trying too hard to please people, if they like you, they like you.

27. a. There is too much emphasis on athletics in high school.
    b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.
    b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29. a. Most of the time I can't understand why politicians behave the way they do.
    b. In the long run the people are responsible for bad government on a national as well as on a local level.

APPENDIX F

Pre-Treatment Experience and Attitude Questionnaire

Name_____
SS#_____
Section_____

Sports Experience Questionnaire

DIRECTIONS: Please write your name and social security number on each page. Below are a series of questions about your previous experiences with sports--especially darts. Some of the questions are on a 1 to 7 scale--just note your feelings on this scale as if someone asked you, "on a scale from one to ten."

1. Please briefly describe your previous sports/game experience below. Which sports have you played and at which level of participation, i.e., backyard (informal), church group, junior high, high school, intramural, summer or recreation league, college. Please indicate the number of years you have been playing each sport/game.

   List sports/games here: (use back of sheet if necessary)
   [Example: Volleyball, high school and rec leagues, 7 years]

   (1)_____
   (2)_____
   (3)_____
   (4)_____
   (5)_____
   (6)_____
   (7)_____
   (8)_____
   (9)_____
   (10)_____

2. What are your feelings towards darts?

1	2	3	4	5	6	7
Like It Intensely			Neither Like It Nor Dislike It			Dislike It Intensely

3. Approximately how many times have you played darts?

1	2	3	4	5	6	7
More Than 100	80-100	60-79	40-59	20-39	1-19	Zero

4. Next weekend, following a week of darts practice how much do you think you can improve your total score?

1	2	3	4	5	6	7
100%	80-100%	60-79%	40-59%	20-39%	1-19%	Zero

5. How self-confident are you at darts?

1	2	3	4	5	6	7
Very Self-Confident			Neither Confident Nor Unconfident			Very Unconfident

6. How skilled are you at darts?

1	2	3	4	5	6	7
Very Skilled			Neither Very Skilled Nor Unskilled			Very Unskilled

7. How many bullseyes do you think you can hit out of 50 attempts?_____

8. What's the highest possible number of bullseyes you predict you'll hit out of 50 attempts?_____

9. What's the lowest possible number of bullseyes you predict you'll hit out of 50 attempts._____

10. Many people get a little anxious/nervous in situations like this--how do you feel?

1	2	3	4	5	6	7
Intensely Nervous			Moderately Nervous			Not Nervous

11. Next weekend, following a week of darts practice how much do you think you can improve your total score? State a percentage (%) here_____

12. Briefly describe how you react when you miss a shot, make a bad play, etc. [Example: "I rant and rave!!" "I kick myself." "I forget it."]

13. Do you have a favorite sport(s)? List here._____

14. Which sport(s) or game(s) are you best at? List here._____

15. How interested and motivated are you to be involved in this sports improvement study?

1	2	3	4	5	6	7
Very Interested and Motivated			Neutral		Very Disinterested and Unmotivated	

16. Do you have any particular sport performance related difficulties you would like to use the next week to work on? If so, describe briefly._____

APPENDIX G

Pre-Treatment Imagery Ability and Style Questionnaire

Imagery Assessment Questionnaire

DIRECTIONS: The purpose of this brief exercise is to determine how you mentally image different events and activities. On the next four pages are a series of actions that you will be asked to imagine in your "mind's eye". Imaging these activities will bring certain images to mind. You are to rate these images on the scales provided. Complete each page before moving on to the next page and do not turn back to check on previous items you have done. Try to note each of the four images separately--independent of how you have scored the other items. Do you have any questions? If so ask the research assistant--if not, please wait for further instructions before turning the page.

Please take a moment to clear your mind and to prepare to focus all of your attention on forming the following image. You may want to close your eyes while forming this image and that's fine. You may want to take a deep breath to help you relax and focus all of your concentration on forming the mental image of peeling an orange. Try to form this image as best you can and then rate the image on the following scales by marking an "X" at the point on the line you feel best describes your image.

1. How clear or real was your mental picture?

1	2	3	4	5	6	7
Very Clear						Fuzzy

2. Did you "hear" anything related to the scene?

1	2	3	4	5	6	7
Many Related Sounds						No Related Sounds

3. Did you "smell" anything related to the scene?

1	2	3	4	5	6	7
Many Related Smells						No Related Smells

4. Did you "feel" textures?

1	2	3	4	5	6	7
Many Tactile Sensations						No Tactile Sensations

5. Did you "feel" your muscles moving?

1	2	3	4	5	6	7
Many Sensations						No Sensations

6. How difficult was it to maintain concentration?

1	2	3	4	5	6	7
Very Difficult						No Difficulty At All

7. How difficult was it to control the image?

1	2	3	4	5	6	7
Very Difficult						No Difficulty At All

8. How actively involved were you in the scene?

1	2	3	4	5	6	7
Very Actively Involved						Not Actively Involved At All

9. Did you see parts of your body other than your hands?

1	2	3	4	5	6	7
Saw Only My Hands						Saw My Entire Body

10. Did you feel like you were outside watching yourself?

1	2	3	4	5	6	7
Totally Outside						Totally Inside

11. Did you feel inside your own body?

1	2	3	4	5	6	7
Totally Inside						Totally Outside

12. Did you switch perspective at all during this image, that is, did your imagery scene stay the same all the way through or did you imagine yourself inside your body performing the actions sometimes and see yourself performing the actions from a spectator's perspective at other times?

1	2	3	4	5	6	7
Much Switching						No Switching

13. From what "perspective" did you visualize these images?

1	2	3	4	5	6	7
Totally Inside Your Body						Totally Outside Your Body

Please take a moment to clear your mind and to prepare to focus all of your attention on forming the following image. You may want to close your eyes while forming this image and that's fine. You may want to take a deep breath to help you relax and focus all of your concentration on forming the mental image of dialing a telephone. Try to form this image as best you can and then rate the image on the following scales by marking an "X" at the point on the line you feel best describes your image.

1. How clear or real was your mental picture?

1	2	3	4	5	6	7
Very Clear						Fuzzy

2. Did you "hear" anything related to the scene?

1	2	3	4	5	6	7
Many Related Sounds						No Related Sounds

3. Did you "smell" anything related to the scene?

1	2	3	4	5	6	7
Many Related Smells						No Related Smells

4. Did you "feel" textures?

1	2	3	4	5	6	7
Many Tactile Sensations						No Tactile Sensations

5. Did you "feel" your muscles moving?

1	2	3	4	5	6	7
Many Sensations						No Sensations

6. How difficult was it to maintain concentration?

1	2	3	4	5	6	7
Very Difficult						No Difficulty At All

7. How difficult was it to control the image?

1	2	3	4	5	6	7
Very Difficult						No Difficulty At All

8. How actively involved were you in the scene?

1	2	3	4	5	6	7
Very Actively Involved						Not Actively Involved At All

9. Did you see parts of your body other than your hands?

1	2	3	4	5	6	7
Saw Only My Hands						Saw My Entire Body

10. Did you feel like you were outside watching yourself?

1	2	3	4	5	6	7
Totally Outside						Totally Inside

11. Did you feel inside your own body?

1	2	3	4	5	6	7
Totally Inside						Totally Outside

12. Did you switch perspective at all during this image, that is, did your imagery scene stay the same all the way through or did you imagine yourself inside your body performing the actions sometimes and see yourself performing the actions from a spectator's perspective at other times?

1	2	3	4	5	6	7
Much Switching						No Switching

13. From what "perspective" did you visualize these images?

1	2	3	4	5	6	7
Totally Inside Your Body						Totally Outside Your Body

Please take a moment to clear your mind and to prepare to focus all of your attention on forming the following image. You may want to close your eyes while forming this image and that's fine. You may want to take a deep breath to help you relax and focus all of your concentration on forming the mental image of <u>riding an elevator</u>. Try to form this image as best you can and then rate the image on the following scales by marking an "X" at the point on the line you feel best describes your image.

1. How clear or real was your mental picture?

1	2	3	4	5	6	7
Very Clear						Fuzzy

2. Did you "hear" anything related to the scene?

1	2	3	4	5	6	7
Many Related Sounds						No Related Sounds

3. Did you "smell" anything related to the scene?

1	2	3	4	5	6	7
Many Related Smells						No Related Smells

4. Did you "feel" textures?

1	2	3	4	5	6	7
Many Tactile Sensations						No Tactile Sensations

5. Did you "feel" your muscles moving?

1	2	3	4	5	6	7
Many Sensations						No Sensations

6. How difficult was it to maintain concentration?

1	2	3	4	5	6	7
Very Difficult						No Difficulty At All

7. How difficult was it to control the image?

1	2	3	4	5	6	7
Very Difficult						No Difficulty At All

8. How actively involved were you in the scene?

1	2	3	4	5	6	7
Very Actively Involved						Not Actively Involved At All

9. Did you see parts of your body other than your hands?

1	2	3	4	5	6	7
Saw Only My Hands						Saw My Entire Body

10. Did you feel like you were outside watching yourself?

1	2	3	4	5	6	7
Totally Outside						Totally Inside

11. Did you feel inside your own body?

1	2	3	4	5	6	7
Totally Inside						Totally Outside

12. Did you switch perspective at all during this image, that is, did your imagery scene stay the same all the way through or did you imagine yourself inside your body performing the actions sometimes and see yourself performing the actions from a spectator's perspective at other times?

1	2	3	4	5	6	7
Much Switching						No Switching

13. From what "perspective" did you visualize these images?

1	2	3	4	5	6	7
Totally Inside Your Body						Totally Outside Your Body

Please take a moment to clear your mind and to prepare to focus all of your attention on forming the following image. You may want to close your eyes while forming this image and that's fine. You may want to take a deep breath to help you relax and focus all of your concentration on forming the mental image of throwing a Frisbee. Try to form this image as best you can and then rate the image on the following scales by marking an "X" at the point on the line you feel best describes your image.

1. How clear or real was your mental picture?

1	2	3	4	5	6	7
Very Clear						Fuzzy

2. Did you "hear" anything related to the scene?

1	2	3	4	5	6	7
Many Related Sounds						No Related Sounds

3. Did you "smell" anything related to the scene?

1	2	3	4	5	6	7
Many Related Smells						No Related Smells

4. Did you "feel" textures?

1	2	3	4	5	6	7
Many Tactile Sensations						No Tactile Sensations

5. Did you "feel" your muscles moving?

1	2	3	4	5	6	7
Many Sensations						No Sensations

6. How difficult was it to maintain concentration?

1	2	3	4	5	6	7
Very Difficult						No Difficulty At All

7. How difficult was it to control the image?

1	2	3	4	5	6	7
Very Difficult						No Difficulty At All

8. How actively involved were you in the scene?

1	2	3	4	5	6	7
Very Actively Involved						Not Actively Involved At All

9. Did you see parts of your body other than your hands?

1	2	3	4	5	6	7
Saw Only My Hands						Saw My Entire Body

10. Did you feel like you were outside watching yourself?

1	2	3	4	5	6	7
Totally Outside						Totally Inside

11. Did you feel inside your own body?

1	2	3	4	5	6	7
Totally Inside						Totally Outside

12. Did you switch perspective at all during this image, that is, did your imagery scene stay the same all the way through or did you imagine yourself inside your body performing the actions sometimes and see yourself performing the actions from a spectator's perspective at other times?

1	2	3	4	5	6	7
Much Switching						No Switching

13. From what "perspective" did you visualize these images?

1	2	3	4	5	6	7
Totally Inside Your Body						Totally Outside Your Body

APPENDIX H

Relaxation Check

DIRECTIONS: Please respond to the items below by placing an "X" over the number or response that most accurately reflects your experience.

1. How relaxed did the tape make you feel today?

1	2	3	4	5	6	7
Completely Relaxed			Moderately Relaxed			Not At All Relaxed

2. Did you experience any images related to darts today while listening to the tape?

1	2	3	4	5	6	7
Many Images			Some Images			No Images

3. Do you believe this program will be beneficial to you in any way?

1	2	3	4	5	6	7
Very Beneficial			Moderately Beneficial			Not at All Beneficial

4. Do you think this training program will assist you in becoming a better darts player?

1	2	3	4	5	6	7
Absolutely Not			Possibly			Most Definitely

5. During this particular session were you able to relax completely?

1	2	3	4	5	6	7
Completely Relaxed			Moderately Relaxed			Not at All Relaxed

6. Since our last meeting, have you refrained from practicing these skills as you were told? Yes_____ No_____

7. Have you had dreams or daydreams about darts since our last meeting?
Yes_____ No_____

8. Do you have any comments about today's relaxation tape?

_____
_____
_____

APPENDIX I

Imagery Rehearsal/Manipulation Check

DIRECTIONS: Answer the following questions as honestly and accurately as you can. Please see the Experimenter or the Research Assistant if you have any questions. Place an X above the appropriate number.

1. How relaxed did the tape make you feel today?

1	2	3	4	5	6	7
Completely Relaxed			Moderately Relaxed			Not Relaxed At All

2. Were you able to relax more completely than yesterday?

1	2	3	4	5	6	7
Much More Relaxed			The Same			Less Relaxed

3. How motivated were you to practice today?

1	2	3	4	5	6	7
Highly Motivated			Moderately Motivated			Low Motivation

4. How clear or "real" was your imagery darts practice session today?

1	2	3	4	5	6	7
Very Clear and "Real"			Moderately Clear and "Real"			No Imagery At All

5. Did you experience any images related to darts today while listening to the tape?

1	2	3	4	5	6	7
Many Images			Some Images			No Images

6. How vivid were these images?

1	2	3	4	5	6	7
Extremely Vivid			Moderately Vivid			Not Vivid At All

7. Were you able to "control" these images (i.e., did the images "cooperate" with you?), in other words to what degree were you able to make the images do what you wanted them to?

1	2	3	4	5	6	7
Total Control			Moderate Control			No Control

8. Did you switch perspective at all during today's session, that is, did your imagery scene stay as instructed or did you imagine yourself (inside your body) throwing the darts sometimes and see yourself practicing darts from a spectator's perspective at other times?

1	2	3	4	5	6	7
Much Switching			Some Switching			No Switching

9. From what "perspective" did you visualize these images? From the perspective of a player (inside your own body) or of a spectator (like watching yourself on home movies)?

1	2	3	4	5	6	7
Total Player's Perspective			Half and Half			Total Spectator's Perspective

10. Were you able to maintain and control the prescribed imagery "perspective" that the tape told you to?

1	2	3	4	5	6	7
Total Control of Perspective			Some Control			No Control of Perspective

11. Did you experience any particular feelings of bodily movement or physical sensations as you went through the motions of the dart-throw during today's imagery practice session?

1	2	3	4	5	6	7
Many Feelings and Sensations			Some Feelings and Sensations			No Feelings and Sensations

12. If you did experience feelings of bodily movement and/or sensation, how intense were they?

1	2	3	4	5	6	7
Very Intense			Moderately Intense			Not Intense At All

13. If you did experience feelings of bodily movement and/or physical sensation, did you find that you were able to "control" them, i.e., make yourself feel what the tape told you to feel?

1	2	3	4	5	6	7
Total Control			Moderate Control			No Control

14. At what "speed" did the majority of your mental imagery present itself?

1	2	3	4	5	6	7
Normal Speed			Slow Motion Speed			Very Slow Motion Speed

15. Do you believe this training program will be beneficial to you in any way?

1	2	3	4	5	6	7
Very Beneficial			Moderately Beneficial			Not Beneficial At All

16. Do you think this training program will assist you in becoming a better darts player?

1	2	3	4	5	6	7
Most Definitely			Possibly			Probably Not

17. Did your imagery practice session contain any sounds; did you "hear" any darts-related "noises", e.g., like the darts hitting the target?

1	2	3	4	5	6	7
Many Sounds			Some Sounds			No Sounds

18. Were you able to "feel" the darts during the imagery session, i.e., feel the texture of the cool metal or stiff feathers? (Note: Tactile means "related" to the sense of touch.)

1	2	3	4	5	6	7
Many Tactile Sensations			Some Tactile Sensations			No Tactile Sensations

19. Were you able to follow the imagery and relaxation instructions without difficulty?

1	2	3	4	5	6	7
Much Difficulty			Some Difficulty			No Difficulty

20. Approximately how many darts did you throw during your imagery practice period today?

1	2	3	4	5	6	7
More than 50	41-50	31-40	21-30	11-20	1-10	Zero

21. Approximately how many of the imagery dart-tosses were bulls eyes?

_____:_____:_____:_____:_____:_____:_____
1 2 3 4 5 6 7
100% 50% 0%

22. Have you had any dreams or daydreams about darts or this training program since our last session?

Yes_____ No_____

23. Was there any particular instruction on the tape that helped you to heighten and/or intensify the imagery experience?

Yes_____ No_____

If Yes, Please state briefly_____
_____
_____
_____

24. Briefly describe any feelings, sensations, or imagery experiences you may have had during today's session. _____
_____
_____
_____

25. Since our last meeting have you practiced these skills?

_____:_____:_____:_____:_____:_____:_____
1 2 3 4 5 6 7
Much Practice Some Practice No Practice

Please remember to return for the next scheduled session at the appointed time. Please remember not to discuss this experiment with anyone until its completion. And please do not practice in any way the skills you are learning and practicing in this study. Thanks for your continued help and cooperation. See you tomorrow.

APPENDIX J

Treatment Scripts

Internal Imagery Rehearsal Script and Instructions

(Begin Here--Instructions for First Night.)

During the rest of this period, you will be learning a cognitive relaxation technique which has been utilized by sport psychologists in athletic settings. This is a technique that has been proven to be quite effective, and it is possible that you will find yourself learning to become more relaxed than you've ever been before. This procedure hinges on the fact that a person can use mental techniques to completely relax not only their mind but their body also. This is to say that the mind can completely relax an individual, thus making it impossible for them to experience tension or anxiety.

In addition you will be asked to form a mental scene that is related to dart-throwing. This technique is called "mental rehearsal" and has been used extensively to help athletes improve various skills. I will describe a scene to you and I want you to imagine it as vividly as possible. If at first you have some trouble imagining the scene, just try to relax and follow my description as much as possible. With time and practice the imagery will come more easily and vividly. Think of this as a time to relax and become familiar with the mental rehearsal technique.

First I want you realize that there are different ways of imagining things and the way you imagine these scenes is very important. Try to stay <u>inside</u> your body and actually <u>experience</u> yourself doing the things I describe. As you generate this mental scene in your mind try to feel and experience things in as much detail as possible and--now

this is important--try to experience the sensation from inside your body. Try to feel and experience the actions as if you were inside your own body. See the actions through your own eyes. Experience all the thoughts, sounds, smells, muscular/bodily sensations, and physical movements that you would if you were actually performing this action. You should only be able to see your hands and arms as you perform. This is an important distinction and it may take some practice to stay inside your body. Try and stay inside your body at all times and experience all the physical sensations and thoughts that you normally would.

It is equally important that you try to make your scene as real as possible. Try to "color" your imaginary scene with all the sights, sounds, and thoughts that would occur in "real" life. This will become easier with practice, and it is only important now that you realize your goal is to mentally enrich the scene described to make it as vivid and physical as possible.

The way the procedure works is that I will instruct you to imagine various experiences, sensations, and images as I describe them to you. In addition, I will offer various suggestions of calm and relaxation as we proceed through the technique. What you are to do is concentrate only on my voice, clear all thoughts from your mind, and follow my instructions. When I ask you to picture or imagine something, I want you to do so as clearly and vividly as you possibly can. Follow along with me and progress at the pace I set for you; do not get ahead of me or behind me. As we go through the procedure, you will find yourself becoming more and more relaxed and comfortable. Focus on these relaxed

sensations and experience them to the fullest degree. Notice the differences between the feelings of tenseness and the feelings of relaxation.

(Begin here for nights two through five.)

Okay, we are nearly ready to begin. Remember, relaxation is an important skill that nearly everyone can learn with just a little training and practice. You can learn to identify feelings of tension and feelings of relxation by learning a few simple techniques. We will begin with a pleasant exercise that is designed to help you learn about how you relax. Okay, let's start. Begin by making yourself as comfortable as possible. Okay, now very slowly close your eyes and keep them closed until instructed to open them again. Notice how as the light fades it is replaced by a soft, friendly, gentle darkness. It is a soothing, pleasant sensation. Slowly become aware of your breathing. It is a soothing, pleasant sensation. Slowly become aware of your breathing. It often helps to take a deep breath, so now slowly take a deep breath. Fill your lungs deeply and hold it. Hold it. Feel the tension. Feel the tightness. Hold it. Slowly now exhale. Slowly. Let the tension go. Become aware of your body.

Now, imagine a warm, pleasant fluid bathing your feet and ankles. This fluid is just the right temperature--not too warm or too cool, just right--and it feels very soothing and relaxing. As it bathes your feet and ankles, you can feel it washing away all the tensions and tightness in the muscles and replacing the tension with warm, soothing sensations of relaxation. The muscles are feeling very relaxed and comfortable, and as they relax, they begin to feel warm and heavy, warm

and heavy--that's right, warm, relaxed and comfortable. Feel those relaxed sensations.

Now picture the warmth moving up your lower legs slowly--slowly bathing your lower legs with warmth and relaxation. Now it's up to your knees and bathing your legs from the knees on down in sensations of relaxation. The muscles in your lower legs and feet are feeling very relaxed; all feelings of tightness and tension are gone, and in their place are sensations of pleasant, soothing, comfortable relaxation. Your legs from the knees on down are feeling very relaxed, and they feel warm and heavy, warm, heavy, and relaxed. That's right--notice how good it feels; notice the difference between tension and relaxation.

Now, the warmth again begins to move; slowly, slowly, waves of relaxation moving into the upper parts of your legs. Feel it bathing your thigh muscles in warm, pleasant sensations of relaxation. It's moving up to your waist and bathing your legs in warm, soothing sensations of relaxation . . . .

(Continue in same manner utilizing similar patter until entire body has been covered. Progress up torso specifying stomach and lower back muscles, chest and upper back, shoulder and neck muscles. Pause at neck and go over torso and leg muscles to feet. Repeat patter at intervals. Progress then to arm, upper and lower muscles, down to finger tips. Progress then to head and facial muscles, covering muscles of chin, jaw, cheek, back of head, forehead, and to top of head. Upon completing, run back over muscles briefly, starting at toes and returning to top of head, using similar patter and instructions.)

Now that we have relaxed your entire body from the tips of your toes to the top of your head, let these physical bodily sensations of soothing relaxation move gently through your mind washing away the tension, letting all thoughts drift from your mind like balloons, lighter than air, floating away, leaving pleasant feelings of coolness and relaxation. Thoughts slipping away leaving only the sound of my voice and the feelings of relaxation. Relaxation washing over your mind, clean, cool, light, empty, calm, relaxed, very deeply relaxed, all thoughts have slipped away. Just deeply relaxed, all thoughts have slipped away. Just deeply relaxed and concentrating on the sound of my voice. Focusing on the feelings of deep relaxation. Let the feelings grow and deepen as you pause let the silence wash over you, no thought, no body. Just relaxation.

You are now in a place where anything positive is possible. This place feels friendly and familiar. In this place you are completely safe, secure, and relaxed. You are in a place where you are free to imagine things as you want them to be. This place is your own. You have the power here, strong, confident, and relaxed. All is quiet. (Pause.) You begin to realize that you are alone in a room much like this one. It is well-lighted and you can see the dartboards against one wall. You begin to explore the room noticing different things. You walk towards the dartboards--noticing how your soft footsteps contrast with the silence around you. You look at the dartboard. You see several darts nearby--you pick up the darts and step towards the shooter's line in front of the target to practice for a while. As you prepare to throw notice several things about the way you are feeling: you feel calm and relaxed. You notice how your breathing is regular. You notice how you

feel strong, confident, and sure of yourself. Your body is clear of all distraction. Slowly you slide your lead foot up to the line a short distance ahead of the other foot. You arrange your body so that you feel balanced and centered--you feel yourself turn your head to face the bullseye--aligned with your shoulder and throwing arm. You hook your gaze on the target fixing your focus on the bullseye--knowing you can throw the perfect dart. You lift the dart feeling the cool, brass weight in your hand. The weight feels just right--familiar and friendly. You hold your eye on the bullseye--feeling relaxed, strong, and confident. Keeping your eyes glued to the target, you lift the dart, bringing the throwing hand in line with your shoulder and eye. You exhale slowly, feeling relaxed and confident--no distractions--just the feeling that the dart will find the mark--bullseye. The target is all there is--your total attention is drawn to the center--to the bullseye. Hold your attention on the bullseye. When the time is right your arm moves forward sharply--automatically. You feel the muscles in your throwing arm extend as you release the dart smoothly and accurately towards the target following through and positioning towards the bullseye. You feel a surge of satisfaction as you see and hear the dart strike the target dead center. With this sense of accomplishment a smile comes to your face and you eagerly look forward to throwing the next dart. You feel good that you were able to let your body perform the way it knows how--without interference from you. You have more darts with you and you are now going to practice throwing for awhile. Pay close attention to each dart you throw. Learn from each dart--mistakes are as valuable as successes. Experience the muscular bodily sensations that accompany each shot--

watch how you place your feet, body, and throwing arm. Stay relaxed and confident. Keep your focus on the bullseye at all times during each shot. This is vitally important. Visually focus on the bullseye. Experience the sensations of your body posture and throwing style. Try to keep track of how many darts you throw and how you do. Try and learn from each dart that you throw. Continue to practice throwing darts for the next few minutes until I tell you to stop. Now form the image of yourself raising another dart and beginning to aim . . . . (Pause.)
(When the tape is over read these instructions.)

Now throw the last dart. (Pause.) I will now count backwards from four to one and as I do you will feel yourself becoming more and more alert. Four--move your legs, Three--now your fingers and hands, Two--move your head around, One--open your eyes and sit up and stretch. That's it. Now please take the clipboard from beside your chair and fill out the brief form. Hand the clipboard to the research assistant when you are through and wait for further instructions.

External Imagery Rehearsal Script and Instructions

(Begin Here--Instructions for First Night.)

During the rest of this period, you will be learning a cognitive relaxation technique which has been utilized by sport psychologists in athletic settings. This is a technique that has been proven to be quite effective, and it is possible that you will find yourself learning to become more relaxed than you've ever been before. This procedure hinges on the fact that a person can use mental techniques to completely relax not only their mind but their body also. This is to say that the mind can completely relax an individual, thus making it impossible for them to experience tension or anxiety.

In addition you will be asked to form a mental scene that is related to dart-throwing. This technique is called "mental rehearsal" and has been used extensively to help athletes improve various skills. I will describe a scene to you and I want you to imagine it as vividly as possible. If at first you have some trouble imagining the scene, just try to relax and follow my description as much as possible. With time and practice the imagery will come more easily and vividly. Think of this as a time to relax and become familiar with the mental rehearsal technique.

First I want you to realize that there are different ways of imagining things and the way you imagine these scenes is very important. Try to get outside your body and actually see yourself doing the things I describe. As you generate a mental moving picture in your mind try to see things in as much detail as possible and--now this is important--

try to see the scene from outside your body. Try to see what someone else would see if they were watching you. That is, instead of seeing things through your own eyes, try to pretend you are watching yourself on a videotape or a home movie. That means that you should be able to see parts of your own body that you normally couldn't see, such as your face and back. This is an important distinction and it may take some practice for you to actually "get outside" your body rather than simply remaining inside it. One way of doing this is to imagine that you are seeing a clone of yourself and you are able to watch and learn as it practices darts.

It is equally important that you try to make your imaginary scene as visual as possible. Try to shut out all sounds and distractions and try to imagine you are watching a silent film of yourself. This will become easier with practice, and it is only important now that you realize your goal is to mentally view the scene described as visually and vividly as possible.

The way the procedure works is that I will instruct you to imagine various experiences, sensations, and images as I describe them to you. In addition, I will offer various suggestions of calm and relaxation as we proceed through the technique. What you are to do is concentrate only on my voice, clear all thoughts from your mind, and follow my instructions. When I ask you to picture or imagine something, I want you to do so as clearly and vividly as you possibly can. Follow along with me and progress at the pace I set for you; do not get ahead of me or behind me. As we go through the procedure, you will find yourself becoming more and more relaxed and comfortable. Focus on these relaxed

sensations and experience them to the fullest degree. Notice the differences between the feelings of tenseness and the feelings of relaxation.

(Begin here for nights two through five.)

Okay, we are ready to begin. Relaxation is an important skill that nearly everyone can learn with just a little training and practice. People can learn to identify feelings of tension and feelings of relaxation by learning a few simple techniques. We will begin with a pleasant exercise that is designed to help you learn about how you relax. Begin by making yourself as comfortable as possible. Okay, now very slowly close your eyes and keep them closed until instructed to open them again. Notice how as the light fades it is replaced by a soft, friendly, gentle darkness. It is a soothing, pleasant sensation. Slowly become aware of your breathing. It often helps to take a deep breath, so now slowly take a deep breath. Fill your lungs deeply and hold it. Hold it. Feel the tension. Feel the tightness. Hold it. Slowly now exhale. Slowly. Let the tension go. Become aware of your body.

Now, imagine a warm, pleasant fluid bathing your feet and ankles. This fluid is just the right temperature--not too warm or too cool, just right--and it feels very soothing and relaxing. As it bathes your feet and ankles, you can feel it washing away all the tensions and tightness in the muscles and replacing the tension with warm, soothing sensations of relaxation. The muscles are feeling very relaxed and comfortable, and as they relax, they begin to feel warm and heavy, warm and heavy--that's right, warm, relaxed and comfortable. Feel those relaxed sensations.

Now picture the warmth moving up your lower legs slowly--slowly bathing your lower legs with warmth and relaxation. Now it's up to your knees and bathing your legs from the knees on down in sensations of relaxation. The muscles in your lower legs and feet are feeling very relaxed; all feelings of tightness and tension are gone, and in their place are sensations of pleasant, soothing, comfortable relaxation. YOur legs from the knees on down are feeling very relaxed, and they feel warm and heavy, warm, heavy, and relaxed. That's right--notice how good it feels; notice the difference between tension and relaxation.

Now, the warmth again begins to move; slowly, slowly, waves of relaxation moving into the upper parts of your legs. Feel it bathing your thigh muscles in warm, pleasant sensations of relaxation. It's moving up to your waist and bathing your legs in warm, soothing sensations of relaxation . . . .

(Continue in same manner utilizing similar patter until entire body has been covered. Progress up torso specifying stomach and lower back muscles, chest and upper back, shoulder and neck muscles. Pause at neck and go over torso and leg muscles to feet. Repeat patter at intervals. Progress then to arm, upper and lower muscles, down to finger tips. Progress then to head and facial muscles, covering muscles of chin, jaw, cheek, back of head, forehead, and to top of head. Upon completing, run back over muscles briefly, starting at toes and returning to top of head, using similar patter and instructions.)

Now that we have relaxed your entire body from the tips of your toes to the top of your head let these physical bodily sensations of soothing relaxation move gently through your mind washing away the

tension, letting all thoughts drift from your mind like balloons, lighter than air, floating away, leaving pleasant feelings of coolness and relaxation. Thoughts slipping away leaving only the sound of my voice and the feelings of relaxation. Relaxation washing over your mind, clean, cool, light, empty, calm, relaxed, very deeply relaxed, all thoughts have slipped away. Just deeply relaxed and concentrating on the sound of my voice. Focusing on the feelings of deep relaxation. Let the feelings grow and deepen as you pause let the silence wash over you, no thought, no body. Just relaxation.

You are now in a place where anything positive is possible. This place feels friendly and familiar. In this place you are completely safe, secure, and relaxed. You are in a place where you are free to imagine things as you want them to be. This place is your own. You have the power here, strong, confident, and relaxed. All is quiet. (Pause.) You now begin to <u>see</u> that you are <u>alone</u> in a room much like this one. It is well-lighted and you can see the dart boards against one wall. You begin to explore this place, noticing different things. As you walk over <u>behind</u> the dartboard you notice that the target's center is a clear, and indestructible bullseye that allows you to observe the person throwing the darts without being <u>seen</u> by them. It's like having your eye to a keyhole, looking through the bullseye into the room you can see the far wall, books on the shelves, chairs, and the door. You see someone walk into the room. You are surprised to see that this person is <u>you</u>. You recognize your face, clothes, and walk. It is fun to be able to see yourself as other people do--kind of like in home movies. You remain behind the dartboard looking through the

clear, indestructible bullseye observing yourself in the room. You see that the other-you is picking up some darts and stepping to the line in front of the dartboard. Through your "keyhole" you are able to see that as the other-you prepares to throw several things seem to happen in a sequence. First you see the other-you step to the line, setting the feet, and getting ready. You see yourself putting one foot slightly ahead of the other and cocking the head to one side to look down the shoulder to sight-in and aim at the bullseye. The eyes never leave the target. The other-you lifts the dart looking towards the target. From your "keyhole" you can see a look of concentration on the face as the other-you sights along the shoulder and aims toward you and the target. After a moment you see the other-you exhale slowly and lean forward slightly. The throwing arm goes back and then moves forward sharply towards the bullseye, the hand releasing the dart smoothly and following through. You see the dart hit the bullseye right in front of your eyes. You can also see a smile appear on the face of the other-you. You can see that the other you has more darts to practice with and you know that what you're going to do is watch the other-you practice darts--paying close visual attention to how the other-you places the feet, body, and throwing arm. Notice the body posture, and throwing style. Try to keep track of how many darts are thrown. Staying relaxed, aware, and interested in how you will learn from how the other-you is practicing darts. Continue to visualize and watch yourself for a few minutes until I tell you to step. You now see the other-you, raising another dart, and beginning to aim . . . . (Pause.)

(Read these instructions at the end of the audiotape.)

Now watch the last dart being thrown. Staying behind the dartboard. (Pause.) I will now count backwards from four to one and as I do you will feel yourself becoming more and more alert. Four--move your legs, Three--now your fingers and hands, Two--move your head around, One--open your eyes and sit up and stretch. That's it. Now please take the clipboard from beside your chair and fill out the brief form. Hand the clipboard to the research assistant when you are through and wait for further instructions.

Relaxation/Attention Placebo Control Instructions

(Begin Here--Instructions for First Night.)

During the remainder of this period, you will be learning a cognitive relaxation technique which has been utilized by sport psychologists in athletic settings. This is a technique that has been proven to be quite effective, and it is possible that you will find yourself learning to become more relaxed than you've ever been before. This procedure hinges on the fact that a person can use active listening techniques to completely relax not only their mind but their body also. This is to say that the mind can completely relax an individual, thus making it impossible for them to experience tension or anxiety.

The way this procedure works is that I will play for you a series of recorded sounds from natural environments and you will listen to them trying to become as involved as you can with these relaxing sounds. What you are to do is concentrate only on the sounds you hear. Clear all thoughts from your mind, and focus only on the sounds on the tape. Stay with the sounds and clear your mind of all thought. As you listen to these natural sounds you will find yourself becoming more relaxed and comfortable. Focus on these sensations and experience them to their fullest degree. Notice the difference between the feelings of tension and the feelings of relaxation. Okay, now we are ready to begin. Get comfortable in the chair, sit back, relax and close your eyes. Keep them closed until you are instructed to open them again.

(Begin audiotape. After the tape is over read these instructions.)

I will now count backwards from four to one, and as I do, you will feel yourself beginning to become more and more alert. Four--move your legs; Three--now your fingers and hands; Two--move your head around; One--open your eyes and stretch. That's it, now please take the clipboard from beside your chair and fill out the brief form. Hand the clipboard to the assistant when you are through and wait for further instructions.

APPENDIX K

Post-Treatment Questionnaire

Post-Treatment Questionnaire

1. Does your dart-throwing imagery seem any clearer/more vivid now that the training program is complete?

1	2	3	4	5	6	7
Much Clearer			Somewhat Clearer			Less Clear

2. Is your dart-throwing imagery any easier to control?

1	2	3	4	5	6	7
Much Easier			Somewhat Easier			More Difficult

3. Did you find that more of your imagery practice dart-throws were successful as the week progressed?

1	2	3	4	5	6	7
All Successes			Some Increase In Successes			No Increase In Successes

4. How would you rate your motivation to learn, progress, and succeed at darts during this training program?

1	2	3	4	5	6	7
Very Motivated			Moderately Motivated			Not Motivated

5. Have you practiced darts in the past seven days?
   Yes_____ No_____

6. Do you negatively evaluate (get down on) yourself after missing a bulls eye?

1	2	3	4	5	6	7
Always			Sometimes			Never

7. Is your success at darts due to: (circle answer)
   a. It's an easy sport.
   b. It was a matter of my effort.
   c. It was a matter of luck.
   d. It was a matter of my natural ability.

8. What part of this imagery training program helped you the most?_____
   _____
   _____

9. What part of this imagery training program helped you the least?____
_____
_____

10. What part of this imagery training program did you enjoy the most?
_____
_____

11. What part of this imagery training program did you enjoy the least?
_____
_____

12. Did you find this study to be interesting and enjoyable?

1	2	3	4	5	6	7
Very Interesting and Enjoyable			Moderately Interesting and Enjoyable		Unenjoyable and Uninteresting	

13. Have you had any daydreams or dreams about darts or this training program in general since the study began?
Yes_____ No_____

14. Do you have any comments to make regarding this study?_____
_____
_____
_____
_____
_____

APPENDIX L

Debriefing Statement

The purpose of this handout is to explain to you in full the purpose and rationale of the Enhanced Sport Performance study that you have just participated in. This experiment was designed to examine the effects of different mental imagery "perspective" on the performance of a precision sport skill, darts.

Studies have shown that mental practice in sport skill can have a positive effect on subsequent performance of that skill--just like physical practice can. This study hopes to be able to find out if mentally practicing a skill from an "internal" perspective is more or less beneficial than mental practice from an "external" perspective.

When you ask an athlete to imagine him/herself performing a sports skill, will he/she imagine the movement/skill from a first- or third-person perspective (Mahoney & Avener, 1977)? Mahoney and Avener (1977) dichotomized the sport-related kinesthetic and visual images reported by elite gymasts into an "internal-external" classification system premised on the "orientation" of a performer's imaginal perceptions during image generation. The authors defined the "internal-external" dichotomy as follows:

> "This distinction refers to the perspective of the imagery. In external imagery, a person views himself from the perspective of an external observer (much like in home movies). Internal imagery on the other hand, requires an approximation of the real-life phenomenology such that the person actually imagines being inside his/her body and experiencing those sensations which might be expected in the actual situation."

Some of you have been mentally practicing from an "internal" perspective, some from a "external" perspective, and some of you have been using a different type of relaxation prior to physically practicing darts. We hope to find out if the differences in your scores are attributable to the type of mental practice or relaxation used.

It is our hypothesis that those of you mentally practicing from the "internal" perspective would outperform those of you in the "external" imagery and relaxation groups. Only after the data have been analyzed we will know for sure. We think that the "internal" imagery perspective contributes to more bodily involvement in the mental practice and perhaps allows the person practicing to feel more confident and "in control".

We sincerely hope that this study has proven to be interesting and enjoyable for you. Your cooperation and enthusiasm throughout this week have been much appreciated. If you have any specific questions regarding the study, would like to give the experimenter any feedback about your personal experience with the imagery or relaxation, or have any suggestions to make regarding this or future studies, please feel free to speak with me now or later on if that is more convenient for you. Again--thanks for your help. Joseph E. Biron, Study Coordinator, 243-6077 (office) PhP 216, 721-0522 (home).

APPENDIX M

Post-Treatment Instructions

Subjects will again be tested in groups of ten. Subjects will be met in the waiting room and escorted to the testing room.

Please come in and be seated. Make yourself comfortable. Today will be our final session together. We will be doing exactly what we did last weekend. Before we begin I would like to say that I will be available to answer and discuss any questions you might have at the end of today's session. Okay?

We'll begin by throwing a few flights of darts. We will be following the same procedure as last weekend. Let's get started. (See Appendix B for procedure.) (Even numbered flights--"good effort" or "that's fine".) (Odd numbered flights--"Okay. Keep on trying to do your best.") Okay. Now we're almost through. Let's move next door and finish up a little paperwork.

Now we'll finish this up by completing the questionnaire you have in front of you. (Distribute Post-Treatment Attitude/Experiment Assessment.) Take your time and answer each item as honestly and accurately as you possibly can.

(Wait until all are finished. Collect questionnaires.)

(After questionnaires have been collected.)

Thank you for your cooperation and participation in the study over the course of this past week. We hope that it has proven to be interesting, beneficial, and enjoyable for you. I'm going to distribute a brief statement outlining the specifics of the experiment, defining and explaining the rationale behind the study. (Distribute debriefing statements.) Are there any questions? If you think of any later on, please feel free to call. Again thank-you for your cooperation and help.