

The Effects of Mental Rehearsal,
Relaxation And Self-Talk Techniques
on Basketball Game Performance



By: Gail Janice Kendall
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A Thesis
Submitted to
The Faculty of Graduate Studies
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Master of Physical Education

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GAIL JANICE KENDALL

A thesis submitted to the Faculty of Graduate Studies of
the University of Manitoba in partial fulfillment of the requirements
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ABSTRACT

The purpose of this study was to investigate the effects of mental rehearsal, relaxation and self-talk training on the performance of a specific defensive basketball skill during competition. An applied behavior modification approach was utilized in an attempt to improve game performance through the development of the subject's mental skills. Four University of Winnipeg female intercollegiate basketball players were chosen as subjects for the study.

A single subject design commonly referred to as a 'Multiple baseline across individuals' was employed to measure each subject's game performance. Each participant received the experimental intervention sequentially following a varying period of baseline data collection. The treatment was spread over a five day period requiring approximately one hour each day. The treatment package included mental rehearsal and relaxation training instruction followed by the development of an individual audio tape which was used by each subject for the remainder of the study period.

The data were analyzed graphically. Through visual analysis changes from the pre-treatment phase to the post treatment phase were indicated.

It was hypothesized that the treatment intervention (i.e. mental rehearsal, relaxation and self-talk) would enhance the player's specific defensive performance.

The results demonstrated that mental rehearsal, relaxation and self-talk training were effective in enhancing basketball skill performance. Treatment effects were noticeable across subjects and encourage further study in this area. Recommendations in terms of both research and practical implications based on the components of the study were then made.

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CHAPTER 1

Introduction

Psychological skills have always played a part in the athlete's preparation for competition. It is only recently, however, that psychological training has been systematically developed, investigated, and implemented.

Several studies have examined the effects of mental practice on performance. Feltz and Landers (1983) found that mentally practicing a skill does enhance performance somewhat more than no practice at all. Their research was based on a meta-analysis of existing research in the area of mental rehearsal.

Anxiety and outside distractions create a number of problems for athletes during competition. Today, the sport psychologist or informed coach can give the athlete information and direction on how to deal and effectively cope with these disruptions. Tutko (1976) compared the reaction to anxiety in sport to the "fight" or "flight" syndrome. As the body reacts physically to this anxiety, your mind picks up these cues, which brings on more anxiety and more pressure. The athlete must find a way to break this disruptive cycle. One method that has been implemented in many mental preparation programs is mental rehearsal. This technique, according to one theory, is actually mental simulation of an action or event which creates a neurological response in the body. As the performance is imagined, impulses are transmitted which travel the nervous patterns associated with the particular action (Rushall 1979). Through this technique, athletes can see and feel themselves performing correctly, consequently reducing their anxiety and improving performance.

One of the major methodological problems in much of the current literature is whether the subject is mentally practicing a skill correctly or incorrectly. It is very difficult to control, observe and evaluate. There does not seem to be a standard instructional approach to the mental rehearsal techniques used.

Rushall (1979) describes six situations which must occur for mental rehearsal to be effective.

1. The athlete must see him/herself in the athletic environment.
2. The athlete must visualize the performance in its entirety (if possible).
3. The performance must be successful.
4. Mental rehearsal should be done at least once before performing.
5. The desired rate of performance should be approximated.
6. The sensation or feel of the performance must be concentrated on.

As does the development of any athletic skill, mental rehearsal takes time and practice. The subject must understand and believe in the strategy for it to be as effective as possible (Botterill, 1987).

Robert Nideffer (1976) has identified attention control as the key to successful athletic performance. There are certain attentional demands in sport and the athlete must be able to adjust his/her focus of attention accordingly. Nideffer describes two dimensions of concentration; width and direction. The first dimension deals with the athlete's ability to shift from a narrow focus to a broad focus of attention. Secondly, the athlete must be able to focus internally or externally as the need arises. At any given time, a person's attention can be thought of as falling at some point along the width and direction continuum. Thus, at the particular instant, they may be described as having either a broad internal focus, a broad external focus, a narrow internal focus, or a narrow external focus. In the

competitive situation, the attentional demands will constantly change. The athlete, who is concentrating effectively, will be able to shift from one focus of attention to the other as the need arises.

The following schematic diagram gives examples of situations requiring these various attentional focuses.

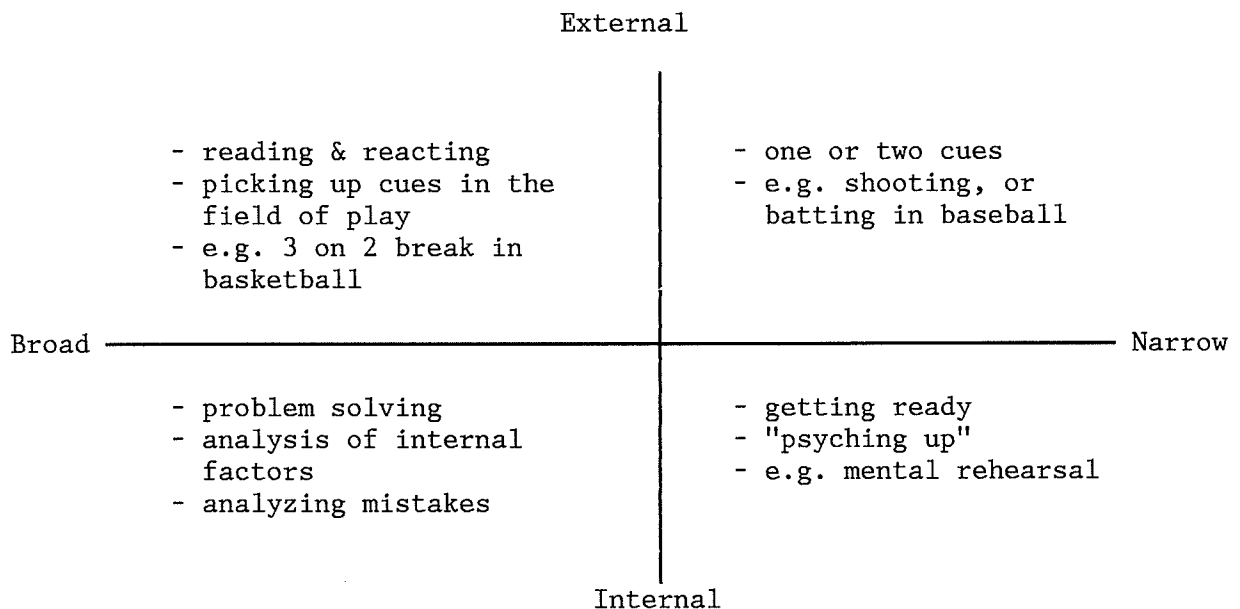


Figure 1 (Nideffer, 1976)

The most common disruption for an athlete is stress or anxiety. In a pressure situation, the athlete may experience the following:

1. The athlete will tend to go to their attentional strength, whether it is appropriate or not.
2. The athlete will tend to narrow their focus and lose their flexibility to shift from one focus of attention to the other.
3. The athlete will tend to go internal and concentrate on the stress or pressure they are feeling.

In these situations, the athlete can be assisted by specific mental strategies which can reduce their anxiety. Nideffer (1976) proposes a program combining relaxation techniques and mental rehearsal to alleviate the problems associated with athlete performance.

In the present study, a mental preparation program combining Rushall's mental rehearsal instructions with self-talk and standardized relaxation techniques, was implemented with four University of Winnipeg female intercollegiate basketball players. The purpose of this study was to investigate the effects of these strategies on a specific game skill with each athlete.

Statement of the Problem

The main focus of this study was to investigate the effects of mental rehearsal combined with relaxation and self-talk on the performance of a specific defensive skill during competition. The defensive skill of cutting off the baseline was measured using an observation technique. Four University of Winnipeg female intercollegiate basketball players were used as subjects. A single subject multiple baseline design across subjects was employed to measure the dependent variable (game performance) and the effect of the independent variable (mental rehearsal, relaxation and self-talk techniques).

Justification for the Study

This study was justified on the following grounds:

1. Coaches who are not cognizant of the interface between psychological

and physical skills are handicapped in their work. Providing these coaches with the kind of information which will enhance the understanding of the relationship between the two types of skills will benefit both the coach and the athlete. One of the goals of this study was to display in a clear and concise fashion, the kind of information needed to develop a practical mental preparation program.

2. A complete examination of the literature in this area, revealed the lack of applied studies and easily understood research covering mental skills. At the same time, with the exception of Feltz & Landers (1983), no real conclusions were arrived at. This study was an attempt to clarify this situation.

3. Canada has a serious lack of expertise in the area of mental preparation. Only a handful of practitioners have been carrying the message of attention control training. It was the hope of this author to highlight the advantages of these skills and present in simplified form, the ease with which these skills could be incorporated into a coaches' program.

Hypothesis

Female intercollegiate basketball players using combined mental rehearsal, relaxation and self-talk techniques, as well as physical practice, would significantly increase the number of correct behaviors by cutting off the baseline drive by the offensive player during basketball game performance.

Delimitations

1. The study was limited to four University of Winnipeg female basketball players, all of whom were members of the intercollegiate Lady Wesmen team.
2. The games examined were the 1987-88 Lady Wesmen games from October 29, 1987, through to the end of the play-off schedule. This limited the opportunity for experimental intervention to thirty-three games.
3. The behaviour measured in the study was limited to cutting off the baseline defensively and creating a turnover.

Limitations

1. The subject's ability to rehearse effectively was a potential limitation to this study. The vividness and quality of the rehearsal was extremely difficult to monitor and evaluate.
2. The subjects were instructed not to communicate to anyone with regard to their mental preparation program.
3. The research design employed was a multiple baseline design across four subjects. Compared to larger sample studies, this design is very strong for internal validity considerations, but weaker for external validity considerations.
4. The experimenter's ability to monitor the subject's private rehearsal behavior.

Definition of Terms

Attentional Focus - Attentional focus is described in two dimensions:

width - either broad or narrow and direction - either internal or external.

Control of Rehearsal - Refers to the ability of the subject to see the desired picture with desired speed and control.

Cutting Off The Baseline - A defensive skill used by the Lady Wesmen Basketball team. The defensive player attempts to force the offensive player to the baseline and then cut off her path to the basketball hoop.

Forcing Baseline - A defensive position in basketball to force the offensive player to only drive towards the baseline and not to the middle of the key.

Mental Rehearsal - A technique used in mental preparation programs. It enables the individual to actually feel and visualize a particular activity as though performing it successfully, but without full physical movements.

Relaxation - The ability to physically relax and calm oneself so that concentration or effective rehearsal can be facilitated.

Self-Talk - A technique used in mental training programs. The subject utilized positive self statements to assist in the mental rehearsal of the desired skill. In the present study, this was operationalized through the audio-tape developed by each subject.

TAIS - Test of Attentional and Interpersonal Style developed by Robert Nideffer (1976).

Turnover - A mistake in basketball by the offensive player forced by the defensive player which causes the offence to lose possession of the ball.

Vividness of Rehearsal - Refers to the ability of the subject to see a clear and vivid picture of what is being rehearsed.

CHAPTER 2

Review of Literature

Past research has been inconclusive in determining whether a given amount of mental practice will enhance the performance of a particular motor task. The current literature continues to demonstrate conflicting results on the contribution mental rehearsal makes to performing various types of tasks by various types of subjects. The purpose of this review is to examine the literature in an attempt to offer additional information on the topic, and to include some possible suggestions for future study.

Mental Rehearsal

Mental practice refers to the symbolic rehearsal of a physical activity in the absence of any gross muscular movements (Richardson, 1967A). It enables the athlete to actually feel and visualize a particular activity as though performing it successfully but without overt movements. Over the years, the typical research design has involved the comparison of the performance of subjects who have physically practiced a skill to those who have privately practiced a skill. These studies normally include a control group which has not received any physical practice or mental rehearsal. There has been considerable variety in the type of tasks used and the length and duration of the experimental periods of both physical and mental practice. Consequently, there has been a great deal of diversity in the findings. For example, Richardson (1967A) found that in the majority of studies reviewed, motor performance was enhanced through some form of mental practice. On the other hand, Corbin (1972) was much more cautious and concluded that there were too many methodological, task and individual

differences in the studies, which led to inconclusive findings. Some of the key issues which must be examined in more detail are; 1. the psychoneuromuscular theory versus the symbolic learning theory of mental practice, 2. the quality versus the quantity of mental practice and its effect on performance, and 3. the effects of mental practice on the acquisition of motor skills.

The Psychoneuromuscular Theory

As a result of Jacobson's (1932) electromyographical research this theory was formulated to explain what occurs during the covert practice of motor skills. The imagining of movement actually creates a slight innervation of the muscles used in the activity. This activity will enhance feedback and is presumed to transfer to the physical practice situation. Corbin (1972), suggested that kinesthetic feedback accompanies imagery and is essential for mental practice to be effective. This feedback ensures that the correct neuromuscular response may lead to the desired overt response.

Harris and Robinson (1986) found supporting results for Jacobson's (1932) early work in their study testing the effects of skill level on EMG activity during internal and external imagery. Beginning and advanced karate students were randomly assigned to conditions of skill level (beginning/advanced) by imagery perspective (internal/external) by side (right/left). The results of the investigation showed that advanced skill level subjects had greater EMG responses than beginning students and that this innervation appears specific to the muscle group needed to execute the task.

The imager's perspective, whether internal or external is a factor which may influence the impact of mental rehearsal (Epstein, 1980). External imagery is characterized by a third person perspective, where the imager sees himself performing the task as an onlooker, not as an actual participant. Internal imagery involves the individual feeling and performing the activity from a first person perspective. A study done by Mahoney and Avenier (1977) on elite gymnasts found that internal or kinesthetic imagery and not visual or external imagery was related to the successful execution in gymnastics. This supports Jacobson's observation that internal "muscular" imaging creates greater muscular activity than visual or external imagery, and is consequently more beneficial for the enhancement of motor skill performance.

Feltz and Landers (1983) in a meta-analysis of over 100 studies on the effects of mental practice found a lack of evidence to support this theory. These researchers noted that no attempt had been made to quantify the muscular activity during rehearsal and there was no direct evidence that the muscle innervation during rehearsal in Jacobson's work was localized to the particular muscles involved in the overt activity. In a study by Shaw (1940) to record action potentials in various body locations during rehearsal of the hand grip dynamometer, there was unexpected muscular activity in the lower leg as well as the arm involved in the visualization. Shaw concluded that there was a generalized muscle innervation from nearly all of the muscle groups tested but there was no indication that localization of this stimulus was occurring. Feltz and Landers (1983) found in more recent work by Hale (1980) that action potentials did not mirror the action of the agonist and antagonist muscle groups used in the biceps

curl. The more recent research fails to support the psychoneuromuscular theory and localization of muscular activity during rehearsal. Instead, it is more likely, that this innervation is generalized and involves the whole body or a complete limb.

The Symbolic - Perceptual Theory

An alternative theory (Sacket, 1934; Morrisett, 1956), claims that mental rehearsal will only enhance motor performance if there are cognitive factors inherent in the activity. In other words, the imager will be able to rehearse the sequence of movements as symbolic components of the task and this will result in improved overall performance (Minas, 1978). The research that has supported this hypothesis has shown that mental rehearsal enhances learning of cognitive type tasks such as the dial-a-maze, block tests, or sequence learning, and that learning of low symbolic tasks, considered to be motor tasks, like the stabilometer were not effected by mental rehearsal.

One of the doubts of many researchers is whether mental rehearsal enables the performer to receive adequate feedback or knowledge of results which will lead to enhanced performance. One study (Minas, 1978) included a mental rehearsal condition with feedback. Her study tried to determine whether or not "the facilitating effects of mental rehearsal were the result of learning the sequence of events or an improvement of the individual motor acts" (Ryan & Simons, 1981). Minas used the throwing of balls into small

bins in a particular sequence for her study. Through separate analysis of the sequence learning and the accuracy of motor performance, it was hoped that the effect of mental rehearsal could be localized. Her results showed that the main analysis was not significant, however, mean scores for groups on each trial indicated that the mental practice group with feedback on the sequence was superior to the physical practice group and the control group. Minas concluded that mental practice under certain conditions facilitates the acquisition of the sequencing component of a complex motor skill. Ryan and Simons (1981), criticized Minas's study on the basis of the task tested. These researchers felt that the findings could not be strongly supported because even with physical practice the motor component (ball tossing), showed no improvement. Ryan and Simons (1981) also studied the effects of mental practice on performance and hypothesized that tasks higher in symbolic or cognitive elements would improve far greater than tasks considered to be high in motor components. The dial-a-maze and stabilometer were used in their experiment so that both types of tasks would be tested. Their results confirmed the major hypothesis that tasks nearer the cognitive end of the continuum (dial-a-maze) were enhanced whereas the task near the motor end (stabilometer) of the continuum showed little or no improvement. Similar results were reported by Smyth (1975) who used a mirror drawing task and Wrisberg and Ragsdale (1979) using a stabilometer and the "McLoy Blocks Test". These results and current research provides support for Morrisett's (1956) and Sacket's (1934) theory on mental rehearsal. However, a problem in much of the research in this area is the variability of the tasks and the definition of what a pure motor skill is. "Motor skills are actually

perceptual motor skills" (Ryan & Simons, 1981), which contain cognitive elements. So when does a skill become totally symbolic or totally motor? One explanation offered by Feltz and Landers (1983) is that "cognitive skills are those which are primarily cognitive with the motor response merely being an appendage to carrying out the previously conceived principle which governs the action."¹

Weinberg, Jackson and Gould (1980), found that mental preparation strategies did in fact improve performance on a muscular strength motor task. Using the Apex Orthtron #7120 to measure muscular strength, power and endurance, Weinberg et al employed five different mental preparation conditions on thirty subjects to study their effects on performance. The researchers' results showed that preparatory arousal and imagery techniques produced a greater change than attentional focus, a control-rest condition, and a counting backwards cognitive distraction condition.

Until a clear definition of the task type used in future research can be standardized, it will be difficult to fully support one view from the other. An area that needs further research on the effects of rehearsal on motor and strength skills is, however, the quality versus quantity issue of the actual mental practice. This will be dealt with in the following section.

¹ Feltz, D. & Landers, D., The effects of mental practice on motor skill learning: A meta-analysis, Journal of Psychology, 5, 1983. pp. 45-46.

Quality Versus the Quantity of Mental Rehearsal and Its Effect on Performance

A common methodological problem in much of the research is the variability of the instructions given to participants in the mental practice groups. It seems that many researchers assume that subjects know what mental rehearsal is and are already proficient imagers without any previous practice. Mental rehearsal is a skill which must be learned and practiced to be effective in enhancing performance.

In a number of completed studies, the researchers commented on the problems of consistency related to mental rehearsal research (Epstein, 1980; Ryan & Simons, 1981; Richardson, 1967; Smyth, 1975; Wrisberg & Ragsdale, 1979; Zecker, 1982; Minas, 1978). Studies are required which will investigate the effect of differing instructions and experience with mental practice.

Ryan and Simons (1981) addressed two secondary questions in their study of the effects of mental rehearsal on the acquisition of motor skills (using a dial-a-maze and stabilometer). First, do individual differences in ability to use mental rehearsal influence performance and secondly, will mental rehearsal have a greater effect if the frequency of the rehearsal is greater in the actual practice time? To answer the first question the researchers had the mental practice group assess the "control" and vividness of their imagery by administering the Gordon test of Visual Imagery Control (White, Sheehan, & Ashton, 1977) and the Betts QMI Scale (Sheehan, 1967). To evaluate the frequency of mental practice, the subjects were asked to add the total number of times they completed the maze during their mental practice sessions. The results were somewhat inconclusive. There were only

thirteen subjects in the mental practice group thus making a meaningful interpretation of correlations difficult. Imagery vividness was found to be a significant factor on the dial-a-maze but insignificant on the stabilometer performance. From the inconsistency of results, the researchers felt these factors were not sufficiently examined.

The influence of relative frequency of mental rehearsal, had great variability. One subject failed to get through the complete maze on one trial while another subject averaged four trips around the maze per practice period. It was assumed by Ryan and Simons (1981) that the greater the number of rehearsals the more improved the performance would be. However, the results did not substantiate this claim. Those who mentally completed the maze more frequently had poorer results than those with fewer completions. These results indicate that the quantity or frequency of rehearsals does not necessarily enhance the effectiveness of the mental rehearsal process. On the critical features of successful mental rehearsal Rushall's (1979) fifth point is that the rehearsal should approximate the rate of performance. Therefore, the mental practice groups should be rehearsing their activity for the same amount of time that it takes the physical practice groups to perform their task.

In post experimental discussions with their subjects, Ryan and Simons (1981) found that those who rehearsed fewer repetitions on the maze, felt they concentrated more and attended and stayed focused on the task cues of the activity, thereby increasing the quality of their rehearsal. The rate of imagery was studied further by Andre and Means (1986). The purpose of this study was to examine the effects of mental practice that utilizes a

slow motion rate of imagery. The authors hypothesized that the quality and vividness of the image would improve if the process was slowed down, thus enabling the subject to see details that may have been unclear. A standard experimental design was employed using a mental practice group, a slow motion mental practice group and a control group. The results indicated that the standard mental practice group improved on the performance measurement by 10.94% and the slow motion mental practice group improved on performance by only 5.62%. The outcome of this study indicates that the rate of imagery may be less effective when the image is slowed down as opposed to when the image simulates the rate of actual performance.

The use of positive outcome imagery has been researched and advocated by a number of prominent sport psychologists (Garfield, 1984; Orlick, 1980; Nideffer, 1985; Williams, 1986; Rushall, 1979). Imagery, in itself, is not necessarily a successful solution. However, imagery that depicts, not only a successful application of the skill but also a positive outcome of the skill, reinforces and influences the possible repetition of the correct overt physical movement. Mental rehearsal may become a self-fulfilling prophecy. If you see yourself executing a skill correctly, the chances of your success in actual motor performance may be increased as opposed to imagining yourself executing the skill within a negative framework.

Woolfolk, Murphy, Gottesfeld and Aitken (1985), investigated the effects of imagery instruction on motor skill performance. Subjects were placed in five different imagery groups. The instructions ranged from positive outcome descriptions to negative outcome descriptions. Performance of the motor task was improved in the positive outcome imagery group as

opposed to the negative outcome imagery group. A general feeling by those who participated in the positive outcome group, was that they had a strong belief that the imagery strategy had helped their performance. This concurs with the reports of countless athletes and coaches, over the years, who have emphasized the effect of positive thinking on athletic performance as compared to the destructive effects of negative thinking on performance.

Another factor which may influence the impact of mental rehearsal is the imager's perspective, whether internal or external. Epstein (1980) found that more successful athletes primarily relied on internal imagery and less on visual or external imagery. One key criteria that Rushall (1979) outlined for effective rehearsal was that the imager should concentrate on the kinesthetic feedback of the activity. This enables the subject to internally imagine the "feel" of the performance which can create covert responses which lead to overt motor performance (Corbin, 1972). Internal imagery has been associated with improved performance and increased muscle activity as opposed to external imagery (Hale, 1982). Harris and Robinson (1986) investigated the effects of skill level during internal and external imagery. Subjects, skilled in karate, were classified as either advanced or beginning students. The results showed that advanced students favoured internal imagery when compared to beginning students. A common problem with the investigation was that subjects reported an inability to maintain a completely internal or external imagery perspective. This lack of imagery control has been reported by other researchers (Hale, 1986). Therefore, interpretations of perspective based findings must be made with caution. It is very difficult to classify subjects as strictly internal or external

imagers, since many individuals unconsciously shift their imagery perspective during mental rehearsal. The data has been inconclusive in this area and future systematic research is needed.

A final point on the issue of the quality versus quantity dilemma of effective mental rehearsal, is whether an individual's experience or familiarity with the task will enhance the quality of his mental practice. Logically, it would seem that if an individual knows the task and the correct sequence of responses, the imagery would be more vivid and more importantly the rehearsal would be successful with correct feedback. This suggests that it may be worthwhile to next examine the affects of mental practice on the acquisition of motor skills.

Effects of Mental Practice on the Acquisition of Motor Skills

A central question relating to current thought on mental practice is whether it would be more effective in the initial stages of learning of a skill or when the task is familiar or well known to the individual. Some evidence has been reported that supports the view that mental rehearsal has its greatest impact on the initial verbal-motor stage of learning. Wrisberg and Ragsdale (1979) studied the factors of cognitive demand and the practice level of subjects on the effects of mental rehearsal with the stabilometer (motor task), and the McLoy Block Test (cognitive task). The results indicated that subjects with greater experience on the stabilometer showed a decrease in performance after four days of practice. These results would support the idea that mental practice effects are typically not found on

motor tasks having few cognitive elements. It seems, however that most research has arrived at a conclusion that conflicts with the above noted study; that is, mental practice is more effective following initial physical practice of a task (Richardson, 1967; Zecker, 1982; Ryan & Simons, 1983; Noel, 1980).

Corbin (1967) attempted to investigate the effects of mental rehearsal and combined overt mental rehearsal as compared to overt rehearsal in the development of a complex motor skill. The task was a form of juggling using a suspended 18" wand from two 36" wands held in the subject's hands. Four groups of subjects were involved in the study; control, mental rehearsal, covert-overt rehearsal, and overt rehearsal. Over the twenty-one day experimental period, the subjects rehearsed overtly or covertly depending on their instructions. The results indicated that mental rehearsal was not effective in developing skilled motor performance. This conclusion does not support the theory that mental practice will enhance performance following some physical practice of a skill. However, this study cannot be viewed as significant with regard to this issue because the juggling task used in the pre-treatment and practice sessions was less difficult than the task used in the post test after the twenty-one day period. It would be more beneficial if further research could be done using the same task in the pre and post test, after an extended period of practice time.

Noel (1980), using a mental rehearsal technique combining progressive relaxation and mental rehearsal, found that highly skilled tennis players benefitted more from mental rehearsal on accuracy of first serves than did lesser skilled players. These results and other similar findings, can be

attributed to the quality and accuracy of mental rehearsal with subjects who have had previous experience with the task. Bandura (1978), has suggested that imagers who have already learned or been exposed to a particular motor skill will have a pre-designed and accurate representation of the sequences involved in the skill which will enhance the quality and effectiveness of the covert rehearsal. Mackay (1981) stated that "mental practice cannot facilitate the execution of unfamiliar skills, thus it will be highly beneficial for the practiced performer such as a championship tennis player who wants to rehearse higher level aspects of the game".²

In Harris and Robinson's (1986) investigation, advanced karate students produced more muscular efference during imagery and were better at responding to imagery instructions than beginning students. This was attributed to a better and clearer understanding of the skill involved in relationship to the imagery content.

From the current research, it can be suggested that mental rehearsal may be more effective for highly skilled athletes and early learning should be facilitated more with physical practice than mental practice.

One of the recurring problems, noticed from the research, is that most studies employ mental practice sessions of short duration, with little direction or instruction given on mental rehearsal techniques. It is apparent that further research is needed which includes research designs such as multiple baseline, with an extended experimental period where subjects can be exposed to and become efficient in mental rehearsal techniques.

² Mackay, D. The problems of rehearsal or mental practice. Journal of Motor Behavior, 13, 1981. p. 17.

There are a number of advantages in using multiple baseline designs (Wollman, 1986). An obvious one is that changes in individual performance can be detected easily in single subject designs, whereas, in a large group design, they may become masked or lost. Secondly, this type of design may be better suited for highly skilled or elite athletes who will most likely improve only slightly in performance after implementation of the intervention. This change, however small, is significant and can be detected consistently within this design. Finally, as mentioned earlier, mental rehearsal is a technique which requires time and practice to perfect. This research design enables the investigator to realistically employ a mental rehearsal program and effectively monitor the results and performance changes over time.

Problems With Previous Studies

A review of literature of any particular topic has an inherent problem. Very few of the researchers give sufficient information in their reports to enable the reader to ascertain the experience of the subjects, the clarity of their instructions, or the familiarity of the researcher with the particular activity. A major problem has been the emphasis on results and performance outcomes rather than the process of mental rehearsal itself (Bird, 1984).

Due to this lack of information, it may well be that the researcher had already anticipated some of the problems that will be raised in this section. However, it can only be assumed, since it is not directly addressed, that this was not the case.

The following are some of the weaknesses found in the current literature:

1. The variability of the tasks used in the various studies makes comparisons or generalizations very difficult.
2. The lack of information on the variable skill levels of the subjects leads to an inability to account for the difference between subjects.
3. Mental rehearsal as a skill is very difficult to control, observe, and evaluate.
4. There is very little information on the actual procedures used in mental practice. The instructions given to the subjects have not in any way been standardized.
5. The researchers assume that the subjects will be capable of using skills and techniques of mental rehearsal without first giving them a proper understanding of what is expected or will best accomplish the task.
6. The researchers themselves should have undergone some training in the techniques of mental rehearsal to enable them to adequately transmit the required information to their subjects.
7. Proper comparison of results requires that the initial skill of the various groups be known. Otherwise, this variable becomes a factor in the study and can affect the results. This becomes even more important when the effects of mental practice are studied on groups who have a high skill

level, as opposed to the effects of mental practice on subjects who are merely learning a skill.

8. Many of the researchers reported that in post-experimental interviews, the subjects were quite frank about their difficulty with, and understanding of, mental rehearsal techniques.

If there are to be valid conclusions as to whether mental practice assists; a) in cognitive tasks, b) pure motor tasks, c) early learning of a skill, d) retention of a skill, and e) enhanced performance of a well known skill, then future experiments must attend to certain standards.

Suggested standards are as follows:

1. The researcher must personally be versed in the skills required for mental practice.
2. Instruction to subjects must be detailed and consistent.
3. Attention must be given at some stage in the study to an understanding by the subjects of not only the imagery involved but the actual feeling or kinesthetic value of a successful completion of the task.
4. The length of the study must be of sufficient duration to effectively analyze the effects of mental rehearsal.
5. Since anxiety can often disrupt the subject with negative or task irrelevant thoughts, relaxation should be used prior to or in combination with mental rehearsal training (Harris and Robinson, 1986; Hellstedt, 1987).
6. A method must be developed to ascertain the quality of the mental rehearsal in order to adequately standardize the results from such research.
7. A method which may be employed to determine the quality of the subject's rehearsal sequence is to thoroughly monitor the individual's

experience (Wollman, 1986). This might include interviews or questionnaires which monitor the thoughts, feeling and content of the experience itself.

What is being suggested is that a subject as complex and as difficult to measure as mental rehearsal must have some standardization in order for the results of various experimenters to be evaluated and compared. Conclusions cannot be generalized if an experiment merely encompasses one small aspect of the problem, i.e. subjects who are learning a new task cannot have the results of their experiment judged as covering an entirely different group who are considered experts on the same task.

Ideally, the research should be a very comprehensive experiment covering all the areas outlined in this critique and conducted by a researcher thoroughly familiar with both the task, and the skills of mental rehearsal. Modifications might include the use of treatment tapes, a longer treatment phase, more informative and salient rehearsal instructions (Andre and Mean, 1986).

It is perhaps unrealistic to advocate such an all encompassing piece of research which when completed will have answered all the problems and criticisms which could be raised. However, it is extremely important that the researcher should first consider the potential pitfalls prior to designing the study rather than after.

CHAPTER 3

Methods and Procedures

Sample Selection

The sample selected for this investigation was four female intercollegiate varsity basketball players. Since the behavior being studied occurs from the wing position of the basketball floor, all four subjects were perimeter players. A second consideration for sample selection was the amount of playing time the subjects received. To ensure that enough measuring points were collected, the subjects were those who start for the team or those who play often.

All subjects selected were briefed on mental preparation training and its value. It was determined from this initial interview, whether the subject wanted to participate in the study and could commit themselves to the training period.

Experimental Design

A single subject design referred to as 'Multiple Baseline Across Individuals' (Kratochwill, 1978) was employed for this study. The design requires that a stable pre-treatment assessment of the dependent variable (cutting off the baseline) be maintained. A pre-treatment condition refers to a number of observations or measurement points which are made in the absence of the independent variable or intervention (Kratochwill, 1978). After a stable pre-treatment assessment was apparent for each subject, the intervention (mental rehearsal and relaxation) was introduced to the

first subject. It was expected that the intervention would only affect that subject who was introduced to the intervention while the other three subjects performance would remain stable. A sequential introduction of the intervention continued until all the subjects had received the mental rehearsal, relaxation and self-talk training. Ideally, the intervention should not be introduced to the next subject until a change is noted in the data of the first subject. Consequently, when a change is noted on the second subject, the intervention would be introduced to the third subject and so on until all four subjects have been intervened upon. A baseline of the dependent variable for the first subject was taken for a maximum of the first seven games followed by the second subject at a maximum of twenty-one games, the third subject at a maximum of twenty-four games, and the fourth subject at a maximum of twenty-seven games. The data on each subject was analyzed independently. It was determined who would be intervened upon next through eyeballing the data. The stability of the pre-treatment measures was taken into account. S2 was not intervened upon until game twenty-one due to an injury which sidelined her during the first part of the study. S3 and S4 were intervened upon shortly thereafter. If an increase in behaviour can be seen at the time of intervention and repeated across individuals, the results can demonstrate that the intervention was responsible for the change in behavior.

Experimental control was dependent upon the subjects commitment to not share or discuss their intervention procedures with each other. This communication could influence baseline stability. The investigator discussed the concern with the subjects to ensure that it did not occur.

Single subject design referred to as multiple baseline across subjects was valid for this study to the degree that the dependent variable (game performance) was affected by the independent variable (mental rehearsal, relaxation and self-talk training).

Instrumentation

An instrument was developed to measure the dependent variable. The behavior of cutting off the baseline defensively was rated as either correct or incorrect, by the principal investigator and one assistant. The observers recorded their observations on a chart developed for this study (see Appendix A). Six specific behaviors were rated as follows:

Behavior 1: The behavior where the athlete does not establish the correct defensive position.

Rating: Incorrect

Behavior 2: Force baseline and get beat to the basketball hoop and foul the offensive player.

Rating: Incorrect

Behavior 3: Force baseline and the offensive player beats you to the basketball hoop and scores.

Rating: Incorrect

Behavior 4: Force baseline and cut off the offensive player's path to the basketball hoop and create a turnover.

Rating: Correct

Behavior 5: Force baseline and cut off the offensive player's path to the hoop and force a missed shot.

Rating: Correct

Behavior 6: Force baseline and cut off the offensive player's path to the hoop and force the pass back out.

Rating: Correct

All games after October 29, 1987 were videotaped and analyzed using the measurement chart developed by the research team. To establish inter-observer agreement, the games and scrimmages in October were videotaped and used as a pilot study. The investigators first viewed the films of the first two pre-season scrimmages together to establish agreement on identifying the six behaviors. Once agreement was reached, each investigator viewed the films of the next two pre-Christmas games separately and rated the dependent variable as they perceived it. From this point, the two investigators compared their observations to establish a minimum of 80% agreement of results.

The games from October 29, 1987 were used for the study results. An Inter-observer reliability (IOR) check was done for each game during the research period, to ensure that inter-observer agreement was continuing throughout the study.

Internal and External Validity

Internal validity is the basic minimum without which any experiment is uninterpretable (Drew, 1976). An internally valid experiment is one which has controlled all systematic influences other than that which is under study. The potential threats to internal validity of a multiple baseline across subjects design are: history, maturation, instrumentation, instability of results, change in unit composition and reactive intervention (Kratowill, 1978).

History and maturation could both be possible threats to internal validity in the present study. If, for example, a drastic change in the dependent variable was recorded on one baseline measurement and then returned to a more stable baseline on following measurements, the change could be attributed to some historical event which affected the behavior. Maturation could be evident if pre-intervention measurements show a continual increase. Intervention points were repeated to lessen the effects of history throughout the study. It was expected that development of the subjects would occur throughout the season due to physical improvement. This was taken into account when the final analysis occurred. The subjects were also instructed to keep their intervention procedures private to ensure that possible improvements are due only to their intervention not to some extraneous variable.

The problems associated with instrumentation were controlled by testing for inter-observer agreement between the two investigators. Ensuring the reliability and objectivity of the measuring device occurred for every game through the testing period.

Instability of results was expected to some degree because of the nature of the young athlete or the skill level of the opponent. It was possible that performance of the support players would be inconsistent because of their lack of playing experience. This variability was taken into account when the results were analyzed. Changes in the experimental unit could occur due to injuries or poor performances. With four subjects, it was unlikely that this would be a major threat to internal validity. However, an alternate subject was available if this became a problem so that sufficient data would still be available.

The time of intervention was critical to avoid a possible threat to internal validity. If the treatment was initiated when data scores were low, it would be erroneous to assume that the intervention created the rise in performance. In this study, the intervention points were dependent on the baseline data, which should control for this potential threat.

External validity involves how well the results of a particular study represent or apply to the population, treatment variables, and measurement criteria presumably being studied in the real world (Drew, 1976). Kratochwill (1978) notes the following factors as threats to external validity: description of the independent variable, Hawthorne effects, novelty and disruption effects, experimenter effects, pretest sensitization, posttest sensitization, interaction of history and intervention effects, measurement of the dependent variable, interaction of time of measurement and intervention effects.

The independent variable must be described accurately if results are to be generalized to other situations. In this study, the possibility of this as a threat was minimal. The novelty of being a part of a study is a threat that is difficult to control completely. Since the testing occurred over a lengthy time span the "specialness" that the subjects felt would likely dissipate. Pretest and posttest sensitization was not applicable to this study. It was possible that experimenter effects could be a threat to external validity. An unintentional behavior by the investigator could affect the subject, however, in this study every attempt was made to ensure consistency in treatment from subject to subject. Through repeated measurements, the threats of history and intervention effects were minimal. The time span of the study should also control for possible threats due to interaction of the time of measurement and intervention procedures. The measurement of the dependent variable was controlled through establishment of inter-observer agreement which was done during the first two exhibition games. The reliability and validity of the measurement is critical if generalizations are to be made.

Treatment

The following treatment procedures were followed by the principal investigator for the present study:

September 1987 - The Test of Attentional and Interpersonal Style (TAIS) was administered to the Lady Wesmen Basketball Team.

- The test was scored and interviews followed for each member of the team.

October 1987 - Four subjects were chosen based on the observed need for mental preparation training according to the TAIS results, position on the floor and desire to participate.

- Interviews with the four subjects were held. At this time, willingness to participate and commitment to the training period were established. A consent form to participate was signed by each subject.

October 1 - October 30, 1987 - Games were videotaped and analyzed by the research team to establish inter-observer agreement.

October 30, 1987 - March 1988 - Measurement points were collected and intervention procedures for the study were implemented.

May 1988 - Data was analyzed and documented.

Intervention Procedures

The Lady Wesmen basketball schedule included 33 games from October 30, 1987 to February 20, 1988. The games were played on Tuesdays or weekends.

The intervention was administered to each subject during the five days they were not playing, (See Appendix B, C, D for description of the intervention). The following procedures were implemented for each subject:

Subject 1: A. A baseline was established for a maximum of the first seven games or until the pre-treatment data had stabilized.

B. Day 1 of the intervention included a 30 minute introduction of mental preparation concepts, viewing of a VHS tape titled

"What you see is what you get" (Botterill, 1987), and 15 minutes of relaxation exercises (See Appendix B).

C. Day 2 of the intervention included a 45 minute session on mental rehearsal techniques and exercises which helped the subject determine whether they were imaging appropriately or not (See Appendix C).

D. Day 3 the subject was asked to combine relaxation training and mental rehearsal of suggested competitive situations. This session was approximately 45 minutes (See Appendix D).

E. Day 4 the subject was asked to combine relaxation with rehearsal of the correct behavior for cutting off the baseline defensively. This session was reduced to thirty minutes, and an audio tape was developed which included both a relaxation and mental rehearsal script of the correct behavior. The subject initiated the mental preparation training with the principal investigator acting only as an overseer to ensure that no problems arose.

F. Day 5 or Game Day - On Game Day, before competition, the subject combined relaxation and mental rehearsal of the correct behavior for 15 - 20 minutes using the prerecorded audio tape.

Throughout the rest of the season, the subject mentally trained for a minimum of fifteen minutes per day maintaining the same mental rehearsal strategy on game days with a minimum of two repetitions.

Subject 2 A. A baseline was maintained until a change in behavior was noted in Subject 1 and the baseline data for Subject 2 had stabilized.

B. The procedure followed by Subject 1 was repeated for Subject 2 running for a five day period.

Subject 3 A. A baseline was maintained until a change in behavior was noted in Subject 2 and the baseline data for Subject 3 had stabilized.

 B. The procedure followed by Subject 1 and 2 was repeated for Subject 3 for a five day period.

Subject 4 A. A baseline was maintained until a change was noticed in the data of Subject 3 and the baseline data for Subject 4 had stabilized.

 B. The five day procedure followed by Subjects 1, 2, and 3 was repeated for Subject 4.

Table 1
Intervention Schedules

GAME/DATE	PROCEDURE	SUBJECT
October 29/87	Baseline Data	1, 2, 3, 4
Game 7 November 16-20/87	Intervention Procedure	1
Game 21 January 10-15/88	Intervention Procedure	2
Game 24 January 20-24/88	Intervention Procedure	3
Game 27 February 3-7/88	Intervention Procedure	4

Treatment of the Data

The data were analyzed graphically. The raw scores obtained by the research team were plotted according to the percentage of correct occurrences of the desired behavior. Using visual inspection of the single subject analysis, the following criteria were used to identify whether or not there was a significant experimental effect; the immediacy that an effect was observed following intervention, the fewer the overlapping data points between pre-treatment phase and treatment phase, the size of an effect after intervention, and the greater number of times that effects were replicated across subjects (Martin & Pear, 1988).

The function of the graph is to present summaries, detailed descriptions and a compact analysis of data (Kratochwill, 1978). It enables the researcher to arrive at a rapid and accurate analysis of the facts.

The four subjects each had a log book to enable them to monitor their own feelings and program throughout the study period. This document included subjective information that was helpful in developing a complete analysis of the intervention procedure and outcomes. An evaluation questionnaire was also filled out by the subjects following their intervention period, to assist the investigator in determining the effectiveness of the mental preparation strategy employed (See Appendix E). The subjects were also asked to complete a social validation questionnaire at the completion of the study period (See Appendix F).

CHAPTER 4

Results and Discussion

Reliability Evaluations

Inter-observer reliability (IOR) was calculated by dividing the number of agreements per game recorded by each observer for each game, by the total number of agreements plus disagreements and multiplying the dividend by 100 (Martin & Pear, 1988). The data collected on the four subjects included two separate groups of behaviors that were deemed "correct" or "incorrect" behaviors. "Correct" behaviors were identified as: a) forcing baseline, cutting off the drive and creating a turnover; b) forcing baseline, cutting off the drive and forcing a pass; and c) forcing baseline, cutting off the drive and forcing a missed shot. "Incorrect" behaviors included: a) forcing baseline, cutting off the drive but the offensive player scores; b) forcing baseline and committing a foul on the offensive player; and c) not establishing the desired initial defensive position as the offensive player receives the ball.

Table 2 indicates that for subject one (S1) IOR ranged from 80% to 100% with a mean of 95% for "correct" behaviors. IOR's for the other three subjects (S2, S3, S4) ranged from 75% to 100% with means of 95%, 96%, and 97% respectively. Calculations for the IOR scores on the "incorrect" behaviors produced similar reliability scores. The IOR scores for S1 and S2 ranged from 80% to 100% with means of 98% and 99% respectively. IOR scores for S3 and S4 ranged from 75% to 100% with means of 95% and 94% respectively.

Table 2
Inter-Observer Reliability Data

IOR Summary

"Correct" Behaviors

Subject	Range	Mean	% Above 80%
1	80 - 100%	95%	100%
2	75 - 100%	95%	96%
3	75 - 100%	96%	97%
4	75 - 100%	97%	97%

"Incorrect" Behaviors

Subject	Range	Mean	% Above 80%
1	80 - 100%	98%	100%
2	80 - 100%	99%	100%
3	75 - 100%	95%	97%
4	75 - 100%	94.3%	90%

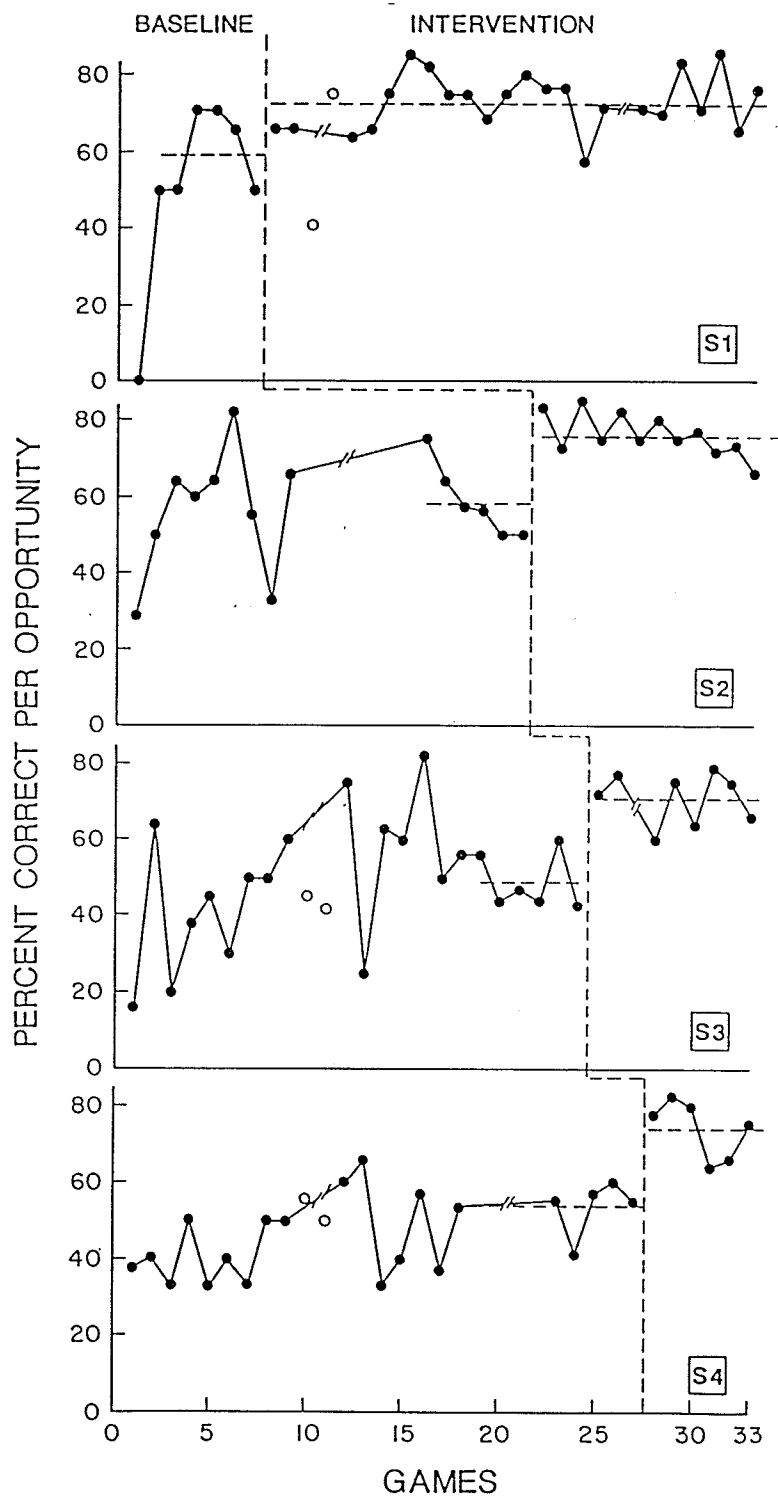
A total of 120 observations were recorded by each observer for the "correct" behaviors and for the "incorrect" behaviors. Out of the 120 IOR's for "correct" behaviors, the IOR fell below the 80% acceptable level on only 3 occasions. For the 120 IOR's for "incorrect" behaviors, the IOR fell below the 80% acceptable level on only 4 occasions. In those situations, the IOR was 75% and occurred where there was a single disagreement on a small number of observations for that game.

Intervention Effects

The effects of mental rehearsal combined with relaxation and self-talk on the subjects' performance of a specific defensive skill during basketball competition are shown in Figure 2.

If all players on a team performed the defensive skill successfully 70% of the time, the team would likely have considerable success against opponents. Therefore, 70% success rate was considered an acceptable and achievable target for players to show "correct" defensive behavior during game performance. The average mean score of "correct" occurrences for all four subjects in the pre-treatment phase was 55.3%. The average mean score for the four subjects in the post-treatment phase was 73.7%.

Figure 2



LEGEND: o - Games played versus a division 1 team from the United States.
 // - Games not played due to injuries.

S1 appeared to demonstrate a positive yet somewhat questionable intervention effect. Three of the six data points for the pre-treatment period overlapped with post-treatment data points. However, just before S1 experienced the intervention, her pre-treatment scores were in a downward direction. Moreover, there was an immediate positive effect after the strategies were introduced. This effect was demonstrated throughout the rest of the study with the mean of "correct" occurrences for S1 at 59.6% during the last six games in the pre-treatment phase, and 73.4% of "correct" occurrences in the treatment phase. In the pre-treatment phase S1 had 28% of her data points above the 70% goal for successful behaviors. During the post-treatment phase, 69.5% of her data points were above the 70% target. Therefore, S1's defensive performance improved noticeably after implementation of the mental rehearsal training. A clear experimental effect was demonstrated with S2, S3, and S4. Only 3 out of 15 data points in the pre-treatment phase overlapped with post-treatment data points for S2. The mean of S2's "correct" occurrences increased from 58.6% during the last six games in the pre-treatment phase to 76.3% after the intervention, with 11 out of 12 data points being above the 70% measure. S2 also demonstrated an immediate and large effect directly after the intervention procedures were introduced.

The data on S3 demonstrated an increase from a mean of 49% during the six games prior to treatment to a mean of 71% after intervention. Only 2 out of 22 data points in the pre-treatment phase were above 70% successful. After intervention, 5 out of 8 data points were above the 70% level. The consistency of performance improved during the post-intervention phase and a

slight upward trend was demonstrated throughout the remainder of the study. For S4 a change in level after intervention was apparent as only one data point was lower than any pre-treatment data points. The mean percent of "correct" occurrences increased from 54% during the last six games of the pre-treatment phase to 74.3% after intervention. S4 had no score above the 70% level in the pre-treatment phase. In the post-treatment phase, 4 out of 6 observations were over the 70% level.

The skill level of the opposition varied from game to game. No attempt was made to control this variable in the study. However, the effects of the intervention appeared to be strong enough to override this factor. S2, S3, and S4, showed increased consistency in performance following intervention, regardless of the opposition they were facing.

Two questionnaires on vividness and control of imagery were administered. These were the Vividness of Visual Imagery Questionnaire (V.V.I.Q.), (Marks, 1973), and a modified version of Gordon's Test of Visual Imagery Control (Orlick, 1980). The responses to the V.V.I.Q. ranged from "clear and reasonable vivid" to "perfectly clear and as vivid as normal vision", on all situations tested. For the Visual Imagery Control Questionnaire, specific scenes were identified and the subject was asked to rehearse each scene. Each subject was then asked to evaluate the image with responses of a) "yes, I can see it", or b) "no I cannot", or c) "unsure". S1, S2, and S3 showed positive results on this questionnaire with S1 imaging 18 out of 20 situations clearly; S2 imaging 19 out of 20 situations clearly; and S3 imaging 17 out of 20 situations clearly. S4, however, could mentally rehearse only 11 out of 20 scenes clearly.

Social Validation

Each subject was asked to complete a social validation questionnaire (Appendix F). The results indicated that all four subjects enjoyed their participation in the study and felt that the intervention procedures used were helpful and worthwhile. The athletes stated that they would not hesitate in suggesting these techniques to other elite athletes. However, they also reported that unless the individual believes that these strategies will work the chance of success is very limited. It was also stated that it is extremely important that the rehearsal be positive and the focus be on successful aspects of the skill being practiced (Botterill, 1987; Woolfolk, Murphy, Gottesfeld, Aitken, 1985).

Throughout the study period, a log book was kept by each subject to monitor their own feelings and programs. Richardson (1967B) suggested that recording the mental practice trial immediately after completion is essential in determining what the subject is rehearsing and also for controlling the frequency of trials. The subjects' weekly documentation was initiated immediately after the subject was intervened upon. The report asked for the rating of their performance from 1-5 on a) relaxation, b) mental rehearsal, c) defensive skill performance in practice, and d) defensive skill performance in games during that particular week.

All four subjects indicated that the relaxation training used was helpful in improving their ability to mentally rehearse. A variable which was recorded in the log book was the progression that was felt to occur on each subject's ability to rehearse over time. This perceived improvement suggests the necessity for having a sufficient number of training sessions to ensure that the athlete has actually developed this skill.

Mental rehearsal may have some important implications for familiarizing an athlete with practice and game performance. In discussion with one subject, she stressed the importance of feeling that she had preformed this skill correctly before actually performing it in a game. She reported feeling more relaxed and less distracted during the game when she had effectively rehearsed this skill successfully prior to her performance. This positive and confident attitude about the skill was identified by all four athletes, as an important factor in effective skill performance.

In summary, the results of this study suggest that mental rehearsal, relaxation and self-talk training were effective in enhancing basketball skill performance. Treatment effects were noticeable across subjects and the results certainly encourage further study in this area.

Discussion

As a result of this study, a number of conclusive findings were reached. The research demonstrated that a mental rehearsal, relaxation and self-talk training program was effective in enhancing performance of a specific defensive skill in basketball.

There has been a great deal of diversity in the findings with regards to the actual treatment procedures used in mental practice. Richardson (1967A), found that in the majority of studies reviewed, motor performance was enhanced through some form of alternate physical and mental practice. The literature on the length and content of the procedures was limited. To be systematic, daily imagery practice is advised and may only require 10 minutes per day to be effective (Vealey, 1986). In the present study, the

subjects were involved in a five day intervention procedure involving sessions lasting 30-45 minutes. Following this concentrated training period, the subjects were asked to mentally rehearse the game situation for a minimum of 10-15 minutes per day.

The changes in level of performance were indicated by comparing the means for "correct" performance between the pre-treatment phase and post-treatment phase. For three subjects, there were minimal overlapping data points from the pre-treatment phase to the post-treatment phase. This shows that generally there was an increase in performance. The only exception was S1 but even in this case there was a dramatic increase in performance from observations recorded immediately prior to intervention. Each of the four subjects increased their mean score from a performance level below the desired 70% standard to a point above the 70% level.

The immediacy of the intervention effect was shown clearly across subjects. Performance level observed immediately after intervention was significantly higher than performance level observed immediately prior to intervention.

The effectiveness of the intervention was demonstrated by the ability to replicate increased performance across subjects. Although S1 showed a less significant improvement in performance, all four subjects showed a definite increase of performance between the pre-treatment and post-treatment phases.

Several investigators have mentioned the importance of attaining clear and vivid imagery in mental practice. The imager's perspective whether "internal" or "external" could be a factor which may influence the impact of mental rehearsal (Epstein, 1980). Mahoney and Avenier (1977), stated that "internal" or kinesthetic imagery and not visual or "external" imagery was more beneficial for the enhancement of motor skill performance. In the present study, none of the four subjects had previous experience with mental rehearsal training. The instructor emphasized the importance of "feeling" yourself perform as you rehearse. The subjects were also asked to concentrate on other kinesthetic cues in the activity. For example, the sound of the basketball hitting the floor, the scent in the gymnasium and the colors of their uniforms. During post-intervention interviews, it was indicated by the subjects that the more descriptive and specific the image was, the more important it was to the athlete. The quality and clarity of the image was felt to be a critical component of effective mental rehearsal training (Ryan & Simons, 1981). One subject scored poorly on the adaptation of Gordon's Test of Visual Imagery Control Questionnaire (Orlick, 1980), to assess vividness of imagery. In discussions with her after that session, she indicated that she had no trouble rehearsing basketball game situations, but she did have problems with scenes with which she was unfamiliar. This lends support to the theory that familiarity with the situation being rehearsed can affect the quality of the visualization (Bandura, 1978). As subjects reported any problems imaging, the instructor modified the content of their mental practice session.

Positive mental rehearsal of an activity can result in a number of payoffs in performance (Botterill, 1985). It prepares the body and mind for activity and enables the athlete to focus on task relevant cues of the desired behavior. It can also assist the athlete in building confidence. The athlete senses that they have performed this activity before, successfully. Finally, positive rehearsal can help the athlete to clear their mind of distracting thoughts and allows the athlete to practice and automate the desired skill. The self reports submitted by the subjects lent support to many of these comments. For example, S4 felt the intervention procedures were a great help in clearing her mind of unwanted distractions. She used comments such as "felt loose", "things were clear in my mind", and "intense". S2 reported that the relaxation training was effective in maximizing her mental rehearsal proficiency. S1 and S4 both stated that they felt more alert and "energized" during game performance when they had utilized their mental rehearsal packages prior to the game. Self report responses by the subjects in this study would indicate that the positive payoffs of mental rehearsal documented by Botterill (1985) appear to be substantiated.

Injuries played a significant role in the management of this study. All four subjects missed at least one game due to illness or injury, with S2 out for six games and S4 unavailable for four games. A fifth subject was

involved in the study until early January when she incurred a serious knee injury and was sidelined for the rest of the season. Despite these problems, reliable results were demonstrated.

The findings contribute to the research in several ways. To begin with, the specific defensive skill examined in this study had not been utilized prior to this investigation. The skill consists of both motor and cognitive components. The athlete must have the physical capabilities to perform and the capacity to make quick decisions depending on the actions of the offensive player. Previous research has investigated the effects of mental practice on performance of motor skills versus cognitive type skills (Ryan & Simons, 1981). The motor task under investigation could be considered a "perceptual motor skill". Ryan and Simons (1981) have suggested that "motor skills are actually perceptual motor skills which contain cognitive elements" (p.43). The question of the effectiveness of mental practice on motor versus cognitive skills was not directly studied in the present investigation. However, the results indicated that across subjects performance did improve after intervention procedures were introduced. Additional study, observing this skill or others containing the same components, may be beneficial in fully addressing this topic area.

The dependent variable under investigation was unique to the current literature in that data were collected on actual game performance. There has been a great deal of diversity in the experimental setting utilized in previous studies. Most have employed a controlled environment involving an experimental group and a control group (Ryan & Simons, 1981; Woolfolk, Murphy, Gottesfeld & Aitken, 1985; Ryan & Simons, 1983; Andre & Means,

1986). The present research allows for a more practical approach to the topic area with data being collected in competitive situations. The results could be informative for coaches and athletes since the study evaluated actual performance and involved an extended training period for mental practice.

Finally, single subject designs, such as multiple baseline across individuals have not traditionally been applied to study the efficacy of mental practice. These designs have been utilized more frequently to evaluate other psychological interventions for sport performance enhancement (Bryan, 1987). Koop and Martin (1983), used a multiple baseline across subjects and across behaviors to test the effectiveness of a particular coaching strategy on swimmers. A study involving free style figure skaters was reported using a reversal replication design (Hume, Martin, Gonzalez, Cracklen & Genthon, 1985). These designs rely on visual inspection of data to evaluate the effectiveness of the intervention. The concern is more for the "practical or clinical significance rather than with the statistical significance" of the data (Bryan, 1987). Single subject designs have many advantages in the study of sport performance enhancement. Small but consistent changes in behavior can be detected. Performance improvements, however slight, are extremely important to an athlete or coach. It is important that consistent changes in performance of individual subjects be closely examined, rather than masked in group statistics and a group

comparison. Finally, these designs provide an effective way to evaluate the intervention effects and performance changes over time. As more research is required to evaluate psychological interventions on sport performance, single subject designs appear to be an acceptable and operative research method. Recent research literature has advocated the utility of this design for practical field experiments (Bryan, 1987; Wollman, 1986).

In the present study an increase in performance was detected across subjects. To ensure that changes in behavior due to physical or practice development occur prior to the treatment phase, sufficient pre-treatment data must be collected. The baseline behavior should be relatively stable before the intervention procedures are introduced to the subject. These precautions were employed in the present study. The single subject design enabled the investigator to evaluate the effects of the mental rehearsal and relaxation package over an extended period of time.

There was some variability in pre-treatment data. Variability in performance was expected initially as the subjects were developing their ability to perform the desired skill. There were, however, minimal overlapping data points from the pre-treatment phase to the post-treatment phase. This indicates that although there may have been some variability in performance, a definite increase was evident across subjects after the intervention was introduced. The consistency in performance in the post-treatment phase across subjects, demonstrated experimental control over this factor.

One element that is difficult to control in any study is the Hawthorne effect. This effect refers to the change in performance by the subjects that occurs merely as a function of being in an investigation (Drew, 1976).

The Hawthorne effect is most likely operative immediately after routine is disturbed. In other words, as a subject is intervened upon the change in activity or the focus on the desired skill may influence performance. However, according to Drew (1976) the effect will decline as the subject becomes acclimated to the "new" routine. In single subject research the length of the study can be a factor in helping to control this element. The "specialness" and immediate influence will likely dissipate over time. According to Parsons (1974) "the lesson of Hawthorne for research design is: Don't let subjects see the data or reward them according to their performance. But such precautions are not the same as keeping subjects "unaware" that they are in an experiment" (p. 930).

Although the athletes could not be kept unaware that they were part of a study, they were not given feedback on the data or rewarded for improved performance on the desired skill. Therefore any immediate improvement as a result of knowing they were part of a study would have had less impact on performance as the study progressed.

The overall results of this study suggest that the combination of mental rehearsal, relaxation and self-talk training is effective in improving the performance of a specific defensive skill in basketball. Even though one subject demonstrated a small yet questionable experimental effect, there was a clear effect evident across the other three subjects. Moreover, the multiple baseline design across individuals demonstrated experimental control of the intervention on the dependent variable (Martin & Pear, 1988).

CHAPTER 5

Summary and Conclusions

Summary

The main focus of the study was to investigate the effects of mental rehearsal, relaxation and self-talk training on the performance of a specific defensive basketball skill during competition. To measure the effects of the intervention 33 game performances were videotaped and analyzed using a measurement chart identifying six possible behaviors. These behaviors were categorized as either "correct" or "incorrect". Four University of Winnipeg female basketball players were selected as subjects for the investigation. Each was briefed on mental preparation training and its potential value for athletic competition. All subjects were required to sign a consent to participate form prior to the initial training period. The intervention procedure included five days of mental rehearsal/relaxation training. At the conclusion of the intervention period, an individual relaxation/rehearsal audio tape was developed for each subject to be used for the duration of the study.

A single subject design commonly referred to as a 'multiple baseline across subjects', was employed to assess the effects of the intervention on the game performance of each subject. A visual analysis of data indicated changes from the pre-treatment phase to the post-treatment phase. Conclusions were then made on the effectiveness of combined mental rehearsal, relaxation and self-talk training along with physical practice on the athlete's performance.

Conclusions

1. The mental rehearsal, relaxation and self-talk training program was an effective intervention procedure to enhance basketball skill performance.
2. The single subject design enabled the researcher to effectively analyze the intervention procedures over an extended training period.
3. The social validation questionnaire indicated that successful performance of a skill using mental training resulted in positive attitudes towards continued use of these procedures.

Recommendations

The following suggestions are made for future study:

1. Additional study is required comparing intervention effects on highly skilled athletes as opposed to less skilled athletes.
2. Further investigation on comparing various intervention procedures would be beneficial, i.e. longevity of the training period, session content, and instructions to participants.
3. Further study which compares vividness of imagery based on questionnaire results with actual skill performance.
4. Additional research is required utilizing single subject designs such as multiple baseline across behaviors, settings, or individuals, to determine the effects of mental preparation procedures. The design would enable researchers to realistically employ a training program over an

extended period and effectively monitor these performance changes over time. This strategy would enable coaches to experimentally evaluate components of their coaching program in actual competitions throughout the competitive season.

Practical Implications

The present study included the following components:

1. Combined mental rehearsal, relaxation and self-talk training sessions on highly skilled elite athletes.
2. A five day intervention procedure with daily sessions lasting 30-45 minutes per day.
3. Utilization of vividness of imagery questionnaires.
4. The development of an audio tape, containing relaxation and mental rehearsal procedures, at the conclusion of the intervention period.
5. The employment of a single subject design commonly referred to as a multiple baseline across individuals.

Based on the present study and the published research on this topic, the following suggestions are made to the coach/athlete interested in implementing a combined mental rehearsal and relaxation training program:

1. The utilization of imagery questionnaires can be helpful in identifying weaknesses or problems during mental practice training.
2. Relaxation training should precede rehearsal sessions to enable the athlete to concentrate on the task and be free of possible distractions.

3. It is suggested that the content of the imagery be as descriptive as possible to enrich the rehearsal process. The utilization of cue words or specific details can be helpful.
4. To allow the athlete to rehearse at any time or at any place an audio tape containing the rehearsal and relaxation scripts should be developed.
5. It is recommended that the program be monitored and evaluated during and after the training period. Questionnaires, log books, and athlete/coach interviews can be effective in determining the positive and negative outcomes of the program.

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APPENDICES

APPENDIX A
MEASUREMENT CHART

GAME vs: _____ GAME NO.: _____

DATE: _____ OBSERVER: _____

Behavior: Forcing to the baseline cutting off the offensive player and creating a turnover by the offensive player.

Correct Behavior			Incorrect Behavior			Frequency of Occurrences
Force base- line cut off drive line and create a turnover.	Force base- line cut off drive line force a pass.	Force base- line cut off drive line and force a miss- ed shot.	Force base- line cut off drive line and they score.	Force base- line get beat to the hoop and foul.	DO NOT establish the correct defensive position.	
Subject 1						
Subject 2						
Subject 3						
Subject 4						

APPENDIX B

RELAXATION TRAINING (Adapted from Rushall's Psyching in Sport, 1979)

The First Relaxation Session

It should be noted that the verbal instructions given here are for example only. For the coach to give this training session, it is best that he/she expresses the content in his/her own way.

1. Select a dim quiet room and ensure that no distractions or interruptions will occur.
 2. Check to see that the athletes are warmly clad and that the clothes that they wear are dry (not damp or sweat laden).
 3. Spread the athletes out around the room so that there is at least one meter between each of them.
 4. Explain the principle behind relaxing:
'Relaxation is important. What we are going to learn will help you to rest and sleep when it is necessary. To get you to relax, we are going to do a set of exercises. There is a scientific reason for this because when you contract a muscle and then relax it, it returns to a state that is more relaxed than before the contraction took place. So, to get you to relax, you need to do a series of exercises which contract and then relax all the muscles in your body. The first session will take about 30 minutes.'
 5. Start in the anatomical position. 'Lie on your back with your arms at your side. Check these features:
 - 1) the middle of your head is touching the mat so that you are looking straight up,
 - 2) your shoulders are exerting equal pressures on the mat,
 - 3) your buttocks are exerting equal pressures on the mat,
 - 4) your calves are pressing equally on the mat, and
 - 5) your heels are pressing equally on the mat.You should be laying straight on the mat. Your spine should be straight, your thighs and calves close together touching lightly and your arms extended by your side with your palms facing slightly up. Check for the last time that you are straight, relaxed, and that the pressure of your body parts on the mat is equal on both sides of your body.
You most probably will find the exercises easier if you lightly close your eyes.'
- The coach should then walk among the athletes to see that their position is correct. It is preferable that no head pillows be used and that no shoes are worn!

6. 'We are now going to do a series of exercises. Each exercise will contain a very hard contraction - hold - and then release sequence. The hold is for a period of four to five seconds. Relax back to the position you are now in. When you do the exercises only contract the muscles that are involved in them.'
7. It is good practice to do a preliminary exercise involving the arms. 'Slowly move your arms to a position where your hands are together, fingers straight, and palms touching as if you were praying. When I say contract I want you to push your hands together as hard as you can and hold that force for five seconds. Then slowly let your arms sink back to your side as you were before. Ready! Contract! Only tighten your arms and shoulders, nothing else - three - four - five - relax slowly to your side. Feel your arms relax, they may tingle a little, they may feel heavy, they may feel warm.'
8. It may be necessary to give some pointers to the athletes at this stage.
 'During that exercise some of you tightened your legs, others their faces. Remember, contract only the part of your body that is being exercised.
 The exercise we have just done is always the first that you do. Let us do it again for practice.
 Slowly move your arms to the prayer position. Ready! Contract - two - three - four - five - relax and slide to your side. Feel your arms heavy, feel them pressing on the mat, relax.'
9. The exercise routine progresses from the toes to the top of the head. After the first two exercises there is an introduction to concentrating on breathing control. By the time the exercises are completed the emphasis should be on breathing control and total heaviness.
10. 'The first exercise is a toe-curl backwards. Moving only your toes and not your ankles, curl you toes back to the tops of your feet. Ready, contract - two - three - four - five - relax. Let your toes go to the position that seems the most natural for them.'
11. 'The next exercise is the opposite of what you have just done, a toe-curl under. Remember do not move your ankles. Curl your toes under your feet. Ready, contract - two - three - four - five - relax. Let them return to where they feel most natural.'
12. This is the stage where there is an introduction to breathing control. 'From now on when you contract do not breathe. When you relax let all the air in your lungs out so that any breathing you do after an exercise is very regular and the very minimum is necessary. I should be able to hear you all breathe out when I say relax. After each exercise do six breaths where you concentrate on making them even and very slight; six identical hardly noticeable breaths.
 The next exercise is an ankle bend. Pull your feet back to your shins as much as you can. Ready! Contract - two - three - four - five - relax and breathe out. Breathe it all out, settle into a steady even breathing pattern. Do six identical breaths.'

13. The next exercise is the opposite of the previous one.
'This is an ankle stretch where you point your feet as much as you can. Ready! Contract - two - three - four - five - breathe out, even breathing. Feel that your feet are heavy, they may even tingle slightly when compared to the rest of your body. See that there is no tension in your toes or ankles and that your heels are pressing on the mat with exactly the same pressure. Keep your breathing even.
14. The next exercise requires you to contract your thighs. Make your thigh muscles as small and as bunched as possible. Ready! Contract - two - three - four - five - breathe out. Breathe evenly.
That completes your leg exercises. We have reached what is called a check point. At this stage you go back and check each segment of your legs for the same feeling of heaviness, the same loss of sensation, the same pressure on the mat. If there is still some tension in a muscle group you should repeat the exercise for that group.
Check that your toes are loose.
Check that your ankles have no tension - they are hanging in a natural position.
See that your calves are totally loose.
Your thighs should be heavy and droopy.
Your buttock should be very soft.
Check that you have the same feeling of heaviness in your feet, your lower legs, the tops of your thighs. Feel where your legs touch the mat. Make sure they feel super heavy where they touch. There should be the same amount of heaviness in each leg. You should feel that the mat is pressing against your legs.
Concentrate on the heavy, dead feeling. If you wanted to move your legs you could not because they are so heavy. Do twelve even easy breaths while your legs are totally motionless.
17. The next exercises concentrate on your body and shoulders. As you do these keep your legs totally relaxed. Also after each exercise do eight controlled minimal breaths. Press your stomach muscles into your abdomen as hard as you can. Do it so that the tips of your spine show through to the front. Ready! Contract - two - three - four - five - breathe out, let out all the tension. Concentrate on your breathing.'
(Leave sufficient time to get in more than eight, very even, controlled breaths.)
18. 'The next exercise requires you to contract all the muscles in your back towards your spine. Pull your shoulder blades together and push the points of your shoulders into the mat. Remember only contract your back muscles, do not rise up off the mat. Ready! Contract - two - three - four five - breathe out. Let the tension in your back go.
Breathe evenly.
19. Now we do the opposite exercise. Compress your chest muscles together and round your shoulder points together. Ready! Contract - two - three - four - five - breathe out. Let your shoulders slide back to the most relaxed position. Breathe shallow and steady.

20. The next exercise requires that you raise your shoulders up towards your ears; a mighty big shrug. Keep everything else still, only move your shoulders. Ready! Contract - two - three - four - five - breathe out. Let it go. Feel your body getting very heavy and losing its sensations.
Do eight more very shallow, hardly noticeable breaths.
21. There is one more exercise to do for your body. That requires you to pull your shoulders towards your feet. This is done by pointing as hard as you can with your fingers and reaching down your thighs as far as possible. Ready! Contract - two - three - four - five - breathe out, relax. Concentrate on using as little air as possible when you breathe.
22. That completes your body exercises. This is the second check point. Here you check you body and leg segments for the same feeling of heaviness, the same loss of sensation.
Check your shoulder looseness and heaviness.
The middle of your back.
Your chest and stomach should be very relaxed.
Your buttocks very loose.
Your calves, ankles and thighs very loose.
See that the mat is pressing evenly on each side of your body, on your shoulders, your buttocks, your thighs, your calves, your heels.
Concentrate on feeling heavy.
Count twelve very, very small even breaths.
23. The last section of your body to relax is your head.
There are many muscles in your neck and head so this is very important. The first exercise requires you not to move anything except to pull your jaw down into your neck. Ready! Contract - two - three - four - five - breathe out. Relax. Count those eight breaths.
24. Next press your head directly into the mat. Do not arch your neck. Press directly down. Ready! Contract - two - three - four - five - breathe out.
Since these exercises use small muscles they require small amounts of energy. Consequently, your breathing should not change much and it should be hardly noticeable.
25. The next exercise requires that you jut your jaw forward as much as you can. Ready! Stick it out - two - three - four - five - breathe out. Relax your jaw. Breathe.
26. Next clench your teeth. Bite them together as hard as you can. Ready! Contract - two - three - four - five - breathe. Eight even breaths.
27. Keeping your teeth lightly together spread your lips apart as much as possible. Ready! Contract - two - three - four - five - relax. Breathe.
28. Press your tongue against the roof of your mouth as hard as you can. Make your tongue as big as possible. Ready! Contract - two - three - four - five - breathe out. Eight even breaths. Feel heavy, even dead all over your body.

29. Your eyes need to be compressed as much as possible. Pull your cheeks up and your eyebrows down as hard as possible to compress your eyes back in to your head. Ready! Contract - two - three - four - five - relax. Let your face go smooth. Smile lightly.
30. The last exercise requires you to make your forehead as wrinkled as possible while keeping your eyes closed. Ready! Contract - two - three - four - five - relax. Let that tension go right out of your head. Feel your face as being smooth, drowsy, very, very relaxed. Your jaw should just hang there.
Do twelve very small, slow, rhythmical breaths.
31. Since that is the last exercise, check again your whole body for heaviness.
Your legs: heels, calves, thighs, buttocks.
Your body: stomach, chest, lower back, shoulders.
Your head: neck, jaw, tongue, eyes, forehead.
See that all pressure points on the mat are even and very, very heavy.
Do twelve very slow breaths.'
32. At this stage the coach can terminate the first training session. However, it is worthwhile to allow the athletes to remain in the relaxed state for five minutes or so. Some of them may be asleep.
33. To arouse the athletes be very gentle in your commands.
'After you have relaxed for a while it is important that you do not suddenly jump up. Gradually bring yourself back to normal by doing the following things:
 - wiggle your toes
 - wiggle your fingers
 - move your feet
 - move your hands
 - open your eyes very slowly
 - smile
 - move your elbows
 - move your knees
 - slowly rise to the sitting position
 - slowly rise to a kneeling position
 - stand
 - have a good stretch
 Now you are free to leave!

Subsequent Relaxation Sessions

1. Subsequent relaxation sessions will be shorter in duration since explanations will be required less and less.
2. This procedure will usually take at least 15 minutes when it is coach-directed and commands are kept to a minimum. It will be shorter when it is under athlete control.
3. The aim should be to have the athletes learn the technique so that they can control themselves and relax when needed.

APPENDIX C

MENTAL IMAGERY TRAINING

*Adapted from Imagery Training for Performance Enhancement, Vealey (1986)

Vividness

Exercise 1

Pick a close friend or someone that you are around quite often. Try to get a sharp image of the person. Try to visualize the details of the person: facial features, body build, mannerisms, clothes, etc.

Now imagine that person talking. Still focusing on the person's face, try to hear his or her voice. Imagine all of the person's facial expressions as he or she talks.

Think about how you feel about the person. Try to recreate the emotions you feel toward him or her whether they be warm friendship, deep love, or admiration and respect.

Exercise 2

Place yourself in a familiar place where you usually perform your sport: the gym, the Athletic Centre. It is empty except for you. Stand in the middle of this place and look all around. Notice the quiet emptiness. Pick out as many details as you can.

Now imagine yourself in the same setting, but this time with many spectators present. Imagine yourself getting ready to perform, and focus on the sights, sounds, smells, and feelings you experience when getting ready to perform in front of the crowd.

Exercise 3

Choose a piece of equipment in your sport such as the ball. Focus on this stationary object. Try to imagine every fine detail of the object. Turn it over in your hands and examine every part of the object. Feel its outline and texture.

Now imagine yourself performing with the object. First, focus on seeing yourself very clearly performing an activity (i.e. shooting). Visualize yourself repeating the skill over and over. Next, try to hear the sounds that accompany this particular movement (swish of the mesh). Listen carefully to all of the sounds that are being made as you perform this skill. Now put the sight and the sound together. Try to get a clear picture of yourself performing the skill and also hear all of the sounds involved.

Exercise 4

Pick a very simple skill in your sport (free throw shooting). Perform the skill over and over in your mind and imagine every feeling and movement in your muscles as you perform the skill. Concentrate on how the different parts of your body feel as you stretch and contract the various muscles associated with the skill. Think about "building a machine" as you perform the skill flawlessly over and over again.

Now try to combine all the sensations, particularly those of feeling, seeing, and hearing yourself perform the skill over and over. Do not concentrate too hard on any one sense. Instead try to imagine the total experience using all of your senses. (See the hoop, hear the ball bounce, hear the sound of the mesh as the ball goes through.)

Controllability

Exercise 1

Imagine again the person you selected for the first exercise in vividness. Concentrate on the person's face and notice all of the different features. Now imagine this person getting up from the chair and walking about a room full of people. Watch the person walk about the room greeting and talking to different people. Continue watching as the person walks up and greets you. Create a conversation with this person.

Exercise 2

Choose a simple sport skill (dribbling) and begin practicing it. Now imagine yourself performing this skill, either with a teammate or against an opponent. Imagine yourself executing successful strategies in relation to the movements of your teammate or opponent (i.e. cross over, change of pace).

Exercise 3

Choose a particular sport skill that you have trouble performing. Recreate the experience in which you have not performed the skill well. Take careful notice of what you are doing wrong. Now imagine yourself performing the skill correctly. Focus on how your body feels as you go through different positions in performing the skill correctly.

Investigator, have them verbalize and go through it vocally.

Self Perception

Exercise 1

Think back and choose a past performance in which you performed very well. Using all your senses, recreate the situation in your mind. See yourself as you were succeeding, hear the sounds involved, feel your body as you performed the movements, and reexperience the positive emotions. Try to pick out the characteristics that made you perform so well (e.g., intense concentration, feelings of confidence, low anxiety). After identifying the characteristics, try to determine why they were present in this situation. Think about the things you did in preparation for this particular event. What are some things that may have caused your great performance. Verbalize them.

Exercise 2

Think back to a sport situation in which you experienced a great deal of anxiety. Recreate the situation in your head, seeing and hearing yourself. Especially recreate the feeling of anxiety. Try to feel the physical responses of your body to the emotion, and also try to recall the thoughts going through your mind that may have caused the anxiety. Now repeat this exercise imagining a situation in which you experience a great deal of anger.

Exercise 3

The purpose of this exercise is to help you to become more aware of things that happen during competition that bother you when you perform. Think about the times when your performance suddenly went from good to bad. Recreate several of these experiences in your mind. Try to pinpoint the specific factors that negatively influenced your performance (e.g. officials, teammates, opponents' remarks, an opponent started to play really well). After becoming aware of the cues that negatively affected your performance, take several minutes to recreate the situations, develop appropriate strategies to deal with the negative cues, and imagine the situations again but this time imagine yourself using your strategies to keep the negative factors from interfering with your performance. Write them down and go back and repeat exercise 1.

*Adapted from Orlick, In Pursuit of Excellence (1980)

The following exercises will give you a rough idea of how well you can control or manipulate your visual imagery in sport. For some athletes, visualizing these scenes is relatively easy, for others it is more difficult. By practicing the clear visualization of scenes, such as those outlined below, you can improve your skills in mental imagery. When introducing your own scenes it helps to move from simple, familiar skills to less familiar or more difficult skills. Gradually introduce more complex and detailed imagery including the visualization of successful coping strategies.

Read each question, then close your eyes while you try to visualize the scene described. Note whether you are able to visualize the scene by checking "yes", "no", or "unsure" in the right hand column.

*Adapted from Gordon's test of visual imagery control in Richardson's Mental Imagery

	YES	NO	UNSURE
1. Can you see yourself standing in your uniform?	_____	_____	_____
2. Can you see it in color?	_____	_____	_____
3. Can you now see your uniform in a different color?	_____	_____	_____
4. Can you see yourself lying down?	_____	_____	_____
5. Can you see yourself stretching?	_____	_____	_____
6. Can you see yourself running along the road?	_____	_____	_____
7. Can you see yourself running up a very steep hill?	_____	_____	_____
8. Can you see yourself running over the top of the hill?	_____	_____	_____
9. Can you see yourself running down the other side of the hill out of control, right into a lake?	_____	_____	_____
10. Can you see yourself performing a sports skill that you often do in practice?	_____	_____	_____
11. Can you see yourself doing the same skill in competition?	_____	_____	_____
12. Can you see the coach and other athletes watching?	_____	_____	_____

	YES	NO	UNSURE
13. Can you see yourself doing that skill a different way?	_____	_____	_____
14. Can you see yourself correctly executing a sports skill with which you have difficulty?	_____	_____	_____
15. Can you see yourself relaxed in a situation which usually causes tension?	_____	_____	_____
Vividness Appraisal			
16. Were you able to get clear and vivid images?	_____	_____	_____
17. Did action proceed like a movie - continuous as opposed to snapshots?	_____	_____	_____
18. In your mind, were you an observer watching yourself perform?	_____	_____	_____
19. In your mind were you an actor - being inside your own body?	_____	_____	_____
20. Were you able to actually feel the movements?	_____	_____	_____
21. Did you feel the tension levels change in the muscles that would have been working?	_____	_____	_____

Day 3 Questionnaire - Specific To Skill

	YES	NO	UNSURE
A. Vividness			
1. Can you see yourself standing in your uniform?	_____	_____	_____
2. Can you clearly see your opponent?	_____	_____	_____
3. When you visualize the skill, can you hear the sound of the ball?	_____	_____	_____
4. Did the action of performing the skill proceed smoothly or was it like seeing a number of snap shots?	_____	_____	_____
5. Can you see yourself relaxed when you execute the skill?	_____	_____	_____
B. Control			
1. As you execute the skill, can you visualize each sequence successfully?	_____	_____	_____
2. As the offensive player initiates their move to the hoop, can you see yourself make the appropriate adjustment?	_____	_____	_____
3. Can you visualize forcing the opponent to pass the ball out after the drive?	_____	_____	_____
4. Can you visualize forcing the opponent to shoot off balance after the drive?	_____	_____	_____
5. Can you visualize forcing the opponent to turn the ball over after the drive?	_____	_____	_____

YES NO UNSURE

C. Feeling

- | | | | | |
|----|--|-------|-------|-------|
| 1. | Can you feel muscular sensations in your body (i.e. legs, arms) as you rehearse this skill? | _____ | _____ | _____ |
| 2. | Is your body relaxed and anticipating the next move? | _____ | _____ | _____ |
| 3. | Can you hear the sound of your shoes on the floor or the bounce of the ball by the offensive player? | _____ | _____ | _____ |
| 4. | As you cut off the drive of the offensive player, do you feel satisfaction? | _____ | _____ | _____ |
| 5. | As you force the offensive player to turn the ball over, do you feel strong and confident? | _____ | _____ | _____ |

VIVIDNESS OF VISUAL IMAGERY QUESTIONNAIRE (VVIQ)

(From Marks, 1973)

The rating scale used in the VVIQ.

Rating	Description
1	'Perfectly clear and as vivid as normal vision'
2	'Clear and reasonably vivid'
3	'Moderately clear and vivid'
4	'Vague and dim'
5	'No image at all, you only "know" that you are thinking of the object'

Items contained in the VVIQ

For items 1 - 4, think of some relative or friend whom you frequently see (but who is not with you at present) and consider carefully the picture that comes before your mind's eye.

Item

1. The exact contour of face, head, shoulders and body.
2. Characteristic poses of head, attitudes of body, etc.
3. The precise carriage, length of step, etc. in walking.
4. The different colours worn in some familiar clothes.

Visualize a rising sun. Consider carefully the picture that comes before your mind's eye.

Item

5. The sun is rising above the horizon into a hazy sky.
6. The sky clears and surrounds the sun with blueness.
7. Clouds. A storm blows up, with flashes of lightning.
8. A rainbow appears.

Think of the front of a shop which you often go to. Consider the picture that comes before your mind's eye.

Item

9. The overall appearance of the shop from the opposite side of the road.
10. A window display including colours, shapes and details of individual items for sale.
11. You are near the entrance. The colour, shape and details of the door.
12. You enter the shop and go to the counter. The counter assistant serves you. Money changes hands.

Finally, think of a country scene which involves trees, mountains and a lake. Consider the picture that comes before your mind's eye.

Item

13. The contours of the landscape.
14. The colour and shape of the trees.
15. The colour and shape of the lake.
16. A strong wind blows on the trees and on the lake causing waves.

APPENDIX D

MENTAL REHEARSAL SCRIPT FOR COMPETITIVE SITUATIONS (Adapted from Garfield, 1984)

Step One:

Achieve deep relaxation - 15 minute relaxation tape will be provided.

Step Two:

Know the performance you will rehearse.

While in a deeply relaxed state, either sitting or lying down, close your eyes and recall a past game performance that gave you a positive feeling. I want you to concentrate on a specific defensive strategy that the team emphasized this year. The skill is forcing baseline and cutting off the drive to the hoop and creating a turnover.

Let's build the image together and verbalize it as we do it.

No let's write down the steps of the skill so you can refer to it when you rehearse the skill on you own (i.e. uniform, gym, feel, smell, opoponent, etc.)

Step Three:

Focus on the parts of your body that are most intensely involved in performing this activity.

As the offensive player receives the ball, you should approach her low with your knees bent - do not react to ball or foot fakes. Your feet should be placed so that you take away the drive to the middle forcing the offensive player to drive to the baseline. Your feet should be straddled, encouraging the drive baseline or sideline. Your body should be balanced with your hand closest to the middle lane tracing the ball.

Your eyes should be fixed on the upper torso of the offensive player ready to move as she puts the ball down. Feel balanced, feel that you can move in any direction. Just like a cat!

As you are forcing the offensive player to the baseline or sideline, see and feel the position of your feet. Feel the power in you legs as you move with her. You have control of both drive lines. You decide where she is going to go. Your body should feel relaxed, anticipating the next move. As she puts the ball down, step back towards the hoop to get position, then quickly slide in and cut off the drive line to the hoop.

As she picks up the ball, stay on your feet, low and trace the ball, snuggling up tight, keeping a wide base to avoid a step through, move to the hoop.

Visualize the offensive player stranded with the ball as you force her to pass the ball back out or take a shot off balance. See her actually turn the ball over by deflecting the pass, bothering her, forcing her to make a mistake, change her shot, force her to pass - get a piece of the ball.

What do you see? You may find you are recalling an important visual clue - your feet in relation to the end line, your opponents body position, where the basketball is in her hands.

Recall Sounds: The sound of your shoes on the floor as you slide in your defensive position to cut off the baseline drive. The bounce of the ball as your opponent dribbles.

Recall Feelings: As you cut off the drive of the offensive player, you should feel successful, in control, energized. As she turns the ball over on a pass or a drive, you should feel strong, proud, confident. Build on these feelings.

Create pictures, sounds and sensations of all kinds to facilitate your image- enriching it.

Now that we have created a picture, let's rehearse the skill 2 or 3 times - each time developing a more vivid, a clear image of this defensive skill.

Step Four: Cue Words

When you have rehearsed to the point where rehearsal of the event seems to come to life effortlessly, go back through it and assign cue words to various parts of the activity. You can list these beside the skills that you wrote down in Step Two of this exercise.

An example of some cue words might be; FORCE - when you establish your defensive position, BLAST - when you move your front foot and maintain that forcing position, CUT OFF - when you cut off her drive to the hoop.

These are just examples. The key for you is to develop your own rehearsal and your own cue words that will work for you.

Now incorporate these into your own mental rehearsal package.

APPENDIX E**SUBJECT WEEKLY LOG BOOK**

Instructions: Please fill in the weekly report form accurately and completely using the following rating scale:

1	2	3	4	5
Poor				Super

The purpose of this report is to document your ongoing feelings (positive or negative) on the mental rehearsal/relaxation techniques you are using.

In the comment sections, please put down your feelings on what helped or hindered your abilities to relax, mentally rehearse, or perform. These may include: school conflicts, personal highs or lows, relationship with coach, friends, etc. or anything else you feel is pertinent to your training.

WEEKLY REPORT -- VISUALIZATION/RELAXATION

LOG BOOK

ACTIVITY	THIS WEEK'S PERSONAL RESULTS	KEY CONTRIBUTING FACTORS (POS. OR NEG.) e.g. thoughts, feelings, circumstances, activities.
RELAXATION	1 2 3 4 5 poor	
VISUALIZATION	1 2 3 4 5 poor	
DEFENSIVE SKILL PERFORMANCE IN PRACTICE	1 2 3 4 5 poor	
DEFENSIVE SKILL PERFORMANCE IN GAME	1 2 3 4 5 poor	

QUESTIONNAIRE - DAY ONE OF VISUALIZATION/RELAXATION TRAINING

Please rate the following statements using the scale provided:

1	2	3	4	5
Strongly				Strongly
Disagree				Agree

1. The concepts of mental preparation were clearly presented by the instructor.

1	2	3	4	5
---	---	---	---	---

Comments: _____

2. The article on visualization was helpful in identifying key concepts on the rehearsal process.

1	2	3	4	5
---	---	---	---	---

Comments: _____

3. The video tape was effective in demonstrating the potential success of visualization techniques.

1	2	3	4	5
---	---	---	---	---

Comments: _____

4. The relaxation overview was clearly presented by the instructor.

1 2 3 4 5

Comments: _____

5. List any important positive thoughts which may have helped today's session.
6. List any important negative thoughts which may have hindered today's session.

QUESTIONNAIRE - DAY TWO OF VISUALIZATION/RELAXATION TRAINING

Please rate the following statements using the scale provided:

1	2	3	4	5
Strongly				Strongly
Disagree				Agree

1. The relaxation training helped you to relax.

1	2	3	4	5
---	---	---	---	---

Comments: _____

2. The rehearsal exercises were helpful in assisting you in developing mental rehearsal techniques.

1	2	3	4	5
---	---	---	---	---

Comments: _____

3. The mental rehearsal instructions were presented clearly.

1	2	3	4	5
---	---	---	---	---

Comments: _____

4. You felt that your ability to rehearse was improved by this particular session.

1 2 3 4 5

Comments: _____

5. List any important positive thoughts which may have helped today's session.
6. List any important negative thoughts which may have hindered today's session.

QUESTIONNAIRE - DAY THREE OF VISUALIZATION/RELAXATION TRAINING

Please rate the following statements using the scale provided:

1	2	3	4	5
Strongly				Strongly
Disagree				Agree

1. The relaxation tape was effective in helping you relax.

1	2	3	4	5
---	---	---	---	---

Comments: _____

2. The rehearsal process (step 1 - step 4) was helpful in developing a clear and concise image of the defensive skill (forcing baseline and cutting off the drive and forcing a turnover) for you.

1	2	3	4	5
---	---	---	---	---

Comments: _____

3. At the end of the session, you were able to clearly rehearse the three correct options of the skill.

1	2	3	4	5
---	---	---	---	---

Comments: _____

4. At the end of the session, you were able to produce the image clearly without the assistance of verbal cues from the instructor.

1 2 3 4 5

Comments: _____

5. You feel that you could now effectively rehearse this skill on your own.

1 2 3 4 5

Comments: _____

6. List any important positive thoughts which may have helped today's session.

7. List any important negative thoughts which may have hindered today's session.

QUESTIONNAIRE - DAY FOUR OF VISUALIZATION/RELAXATION TRAINING

Please rate the following statements using the scale provided:

1	2	3	4	5
Strongly				Strongly
Disagree				Agree

1. The tape was effective in relaxing you and allowing you to rehearse the desired skill.

1	2	3	4	5
---	---	---	---	---

Comments: _____

2. You were able to rehearse effectively without constant feedback from the instructor.

1	2	3	4	5
---	---	---	---	---

Comments: _____

3. You feel that your ability to mentally rehearse has improved.

1	2	3	4	5
---	---	---	---	---

Comments: _____

4. You feel that mental rehearsal will help your on-floor performance of the desired defensive skill.

1 2 3 4 5

Comments: _____

5. List any important positive thoughts which may have helped today's session.
6. List any important negative thoughts which may have hindered today's session.

QUESTIONNAIRE - DAY FIVE - GAME DAY

Please rate the following statements using the scale provided:

1	2	3	4	5
Strongly				Strongly
Disagree				Agree

1. Your rehearsal prior to the game assisted you in physically performing the desired skill correctly.

1	2	3	4	5
---	---	---	---	---

Comments: _____

2. You felt more confident prior to the game in performing the desired skill.

1	2	3	4	5
---	---	---	---	---

Comments: _____

3. Your relaxation/rehearsal tape assisted you in feeling relaxed and ready prior to the game.

1	2	3	4	5
---	---	---	---	---

Comments: _____

4. List any important positive thoughts which may have helped today's performance.

5. List any important negative thoughts which may have hindered today's performance.

6. How would you rate your overall game performance today?

1	2	3	4	5
Poor				Awesome

Comments: _____

7. How would you rate your performance on the desired defensive skill today?

1	2	3	4	5
Poor				Awesome

Comments: _____

APPENDIX F

SOCIAL VALIDATION QUESTIONNAIRE FOR PARTICIPANTS

1. Did you feel the intervention procedures of mental rehearsal and relaxation training were worthwhile?

YES _____ NO _____

COMMENTS: _____

2. Would you like to continue to use these techniques to assist in your training?

YES _____ NO _____

COMMENTS: _____

3. Did you enjoy your participation in this study?

YES _____ NO _____

COMMENTS: _____

4. Would you suggest these techniques to other elite athletes in your sport?

YES _____ NO _____

COMMENTS: _____

