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The effects of imagery and positive self-review on the performance of intercollegiate basketball players

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THE EFFECTS OF IMAGERY AND POSITIVE SELF-REVIEW
ON THE PERFORMANCE OF INTERCOLLEGIATE
BASKETBALL PLAYERS

by

Jonathan Rylaarsdam

Accepted in Partial Completion
of the Requirements for the Degree
Master of Science

Moheb A. Ghali, Dean of Graduate School

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THE EFFECTS OF IMAGERY AND POSITIVE SELF-REVIEW
ON THE PERFORMANCE OF INTERCOLLEGIATE
BASKETBALL PLAYERS

A Thesis
Presented to
The Faculty of
Western Washington University

In Partial Fulfillment of the
Requirements for the Degree
Master of Science

by
Jonathan Rylaarsdam
October 2010
ABSTRACT

Coaches frequently seek new methods to improve performance. The mental skills training of imagery combined with positive self-review has emerged as a possible device to improve athletic performance. This study was designed to examine the effectiveness of imagery and positive self-review on basketball game performance. Four male intercollegiate basketball players were chosen to participate in a single-subject, multiple baseline across subjects design. Baseline percentages of correct performance were compared to post-intervention percentages. Evidence indicated that the intervention was effective across all four participants. Results indicated a mean Win Score (Berri, Schmidt, & Brooks, 2006) increase of .74 across the four athletes. Social validation was also evaluated through exit questionnaires. All of the participants indicated that they enjoyed the intervention and felt that it improved their overall performance.
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CHAPTER I
THE PROBLEM AND ITS SCOPE

Introduction

Mental imagery has been the most studied technique in mental training literature (Morris, Spittle, & Watt, 2005) and has been shown to improve athletic performance (Driskell, Copper, & Moran, 1994; Feltz & Landers, 1983; Martin, Moritz, & Hall, 1999). Imagery can be defined as a mental creation or re-creation of sensory experiences in the mind (Weinberg & Gould, 2007). It can be used as a mental practice technique that integrates multiple senses to re-create an athletic performance as a means to enhance actual performance (Holmes & Collins, 2001). The goal of mental imagery is to reproduce the athletic experience so accurately that athletes feel as if they are actually performing the sport (Holmes & Collins, 2001). Video interventions can be used concurrently with imagery to enhance the imagery experience (Holmes & Collins, 2001; Templin & Vernacchia, 1995).

The use of video interventions within the context of sport consulting predominately falls under the category of self-modeling and symbolic learning. Dowrick (1999) defined self-modeling as an “intervention procedure using the observation of images of oneself engaged in adaptive behavior” (p. 23). Self-modeling can be used in an attempt to increase performance mastery by selectively reviewing video examples of successful target behaviors (Dowrick, 1999; Ives, Straub, & Shelley, 2002). This form of
self-modeling is known as a positive self-review (PSR) (Dowrick, 1999). Most applications of PSR are produced by identifying desired behaviors and then selecting video recordings of those behaviors that are properly executed. This allows the observer to see oneself performing correct behaviors in a finely tuned mental state (Halliwell, 1990).

Research regarding mental rehearsal in the form of PSR has been shown to be effective in increasing athletic performance (Bertram, Brown, Guadagnoli, & Palomaria, 2007; Bradley, 1993; Malroy, 2000; Smith & Holmes, 2004; Starek & McCullagh, 1999). PSR appears suited to improve a rate of a behavior that is below its desired level (Dowrick, 1999). PSR can improve performance aspects through differing means. It can increase confidence by reminding the athlete of previous competence in performance and by demonstrating a positive self-image. PSR can also advance skill refinement, give goal clarification on desired outcomes, and increase self-efficacy, which in turn can increase motivation and/or decrease anxiety (Dowrick, 1999).

Sport psychology professionals have utilized video successfully as a visual feedback tool to modify athletic performance behavior (Gipson, McKenzie, & Lowe, 1989; Halliwell, 1990; Ives, Straub, & Shelley, 2002). However, the use of video related feedback by consultants in an applied setting has been limited because of the impracticality of poor equipment portability and a need for high editing expertise. For example, Gipson et al. (1989) mentioned that despite their apparent effectiveness, PSR videos were not used often in their national volleyball program because of the time involved in producing the tapes. Newer digital video systems are becoming more user-friendly. These systems are also now conveniently available on portable laptop
computers. The advancements in digital video hardware and editing software have made the use of video interventions feasible for sport psychology professionals.

Adding to the accessibility to digital video editing systems is the ever-increasing number of these systems being used by collegiate and professional teams (D. J. Manning, personal communication, March 24, 2008). Nearly all professional teams and most teams at the NCAA division I and II level have some form of a video editing system in their programs. They are used primarily to analyze game film, scout opponents, and occasionally to produce an end of the year highlight film. The primary purpose of purchasing such an expensive system is to be able to make better evaluations of player execution and to develop a strategic game plan for an upcoming game. If the consultant is allowed access to these “ready-made” clips the construction time of a mental skills intervention can be cut drastically. Many video systems allow its user to transfer video clips from one computer to another. This permits the consultant to transfer the desired video from the team’s computer onto a personal laptop.

Coaches, particularly at the collegiate and professional levels, are always looking for an edge to top their opposition. Higher level coaches were found to use mental training more often than the lower level coaches (Jedlic, Hall, Munroe-Chandler, & Hall, 2007). Research has also suggested that the more experience and qualifications a coach had the more likely he or she would find psychological training workshops to be informative and the material covered more useful (Hall & Rogers, 1989). There is a limit to how much a coach can train players physically. There are guidelines provided by organizations such as the National Collegiate Athletic Association (NCAA), which limits the number of hours a team is allowed to practice in a given week. What if the expensive
software an athletic program had purchased had the ability to be utilized as a means to produce an effective training tool that would allow the athlete to better prepare mentally? It stands to reason that many coaches would find it extremely beneficial to have the ability to provide an attractive, easy-to-use mental training tool for an athlete to utilize off the court. The ability to strengthen the mental aspect of his or her players’ games with minimal extra personal work would give a desirable edge.

**Purpose of the Study**

The purpose of this study was to determine the effects of imagery and positive self-review on the performance of intercollegiate basketball players. The secondary purpose was to determine the social validity of the PSR DVD intervention used in this study.

**Hypothesis**

It is hypothesized that the use of imagery and a positive self-review will not increase the performance of intercollegiate basketball players.

**Significance of Study**

This study is unique in that it employs a performance enriching digital hand-held delivery system that is easy to access and use by athletes. Positive results could support the use of such devices in the sporting context. The possible advantage of using hand-held devices to deliver various forms of mental imagery training is that it can be easily integrated into a player’s pre-game routine. Pre-game routines are formed to mentally
prepare athletes for competition. The ability to integrate a brief PSR and imagery routine into an athlete’s pre-game routine may lead to favorable performance outcomes.

Results from this study may support the use of modern technology to produce powerful easy-to-use mental training tools for athletes. The use of technological devices to enrich athletic performances has the potential to be powerful because it allows its user to quickly review and mentally practice many behaviors. The behaviors that are imaged and modeled may increase and improve those behaviors. When positive behaviors are viewed as a part of a mental rehearsal intervention it can be easy to use because of the short amount of time needed to view many behaviors and because its application can be simplified with a hand-held device. The hand-held device allows its use to be flexible (for example, during away contests). Hand-held devices may provide user-friendly access to technology that can mentally train athletes to perform at their highest levels.

Another potentially useful feature about this intervention is that there would not be significantly more work for the coach or consultant. Positive results from this study could support the use of a mental training tool that is relatively easy to produce. This is an important aspect when considering the practicality of mental training interventions (Gipson et al., 1986). The video modeling portion can be made from the clips that are typically already used by coaches. It would only take some organization, slide production, and a combining of music to generate the intervention tool. Once the training tool is created there is minimal subsequent instruction and guidance. At this point the player takes on the majority of the responsibility to adhere to the program.

The ultimate aim of mental skills training is to increase competitive performance. This study will further the limited studies that collect data from game performances
(Jordet, 2005; Kendall, Hryeniko, Martin, & Kendall, 1990; Meyers & Schleser, 1980; Malroy, 2000; Rymal & Ste-Marie, 2007). Successfully measuring an increase of positive outcome behaviors during games would give further support for the use of psychological interventions in athletics.

Gaining the athlete’s perspectives on the usefulness of an intervention through social validity measures is also important. The athlete’s assessments and recommendations may provide insight on the effectiveness of the intervention and possible areas of improvement for future research.

**Limitations of Study**

1. The results of single subject research design studies are not able to be generalized to the population at large.

2. Measurements of behavior are taken from game performances. There are multiple variables such as skill level of competition, team strategy, defensive positioning, and differing conditions for away contests. Game variables can cause inconsistent performance.

3. Statistics from away contests are taken by differing score keepers. This may cause some variance in the tabulation of assists because it is a subjective statistic. While all other statistics are objective there still may be variance among differing score keepers due to errors.
Definitions of Terms

Imagery – The mental creation or re-creation of sensory experiences in the mind (Weinberg & Gould, 2007).

Modeling – A cognitive process in which the learner attempts to imitate an observed action or skill performed by another individual (Bandura, 1986).

Positive Self-Review – Review of a digital recording that uses game footage of a player’s performances to form highlights of desirable behaviors (Dowrick, 1999).

Self-Confidence/Self-Efficacy – An individual’s belief in ability to achieve a specific performance outcome (Bandura, 1986).

Win Score – An efficiency statistic that measures basketball performance (Berri, Schmidt, & Brook, 2006).
CHAPTER II
REVIEW OF LITERATURE

Introduction

Modeling has long been used to teach or reinforce behaviors across diverse environments such as athletic, social, clinical, academic, and business-related (Dowrick, 1999). Modeling has been described as “…one of the most powerful means of transmitting values, attitudes, and patterns of thought and behavior” (Bandura, 1986, p. 47). Observational modeling has been shown to increase movement dynamics and outcome measures (Ashford, Bennett, & Davids, 2006). Bandura’s (1986, 1997) social cognitive theory of observational learning has been used to describe how modeling promotes skill acquisition through symbolically encoded information. Social cognitive theory includes the belief that modeling can boost self-efficacy which can increase performance and also improve motivation and reduce anxiety (Bandura, 1997).

Positive self-review (PSR) is a subclassification of a more specific form of modeling called self-modeling (Dowrick, 1999). PSR can be used to increase a low frequency of desired behavior (Dowrick, 1999). The low frequency may be due to a decline in frequency or it may be that the athlete has not yet reached a level that is desirable. Theoretically, PSR could not only improve a low rate in frequency but it could also increase a medium level behavioral rate to a level of high occurrence. PSR has the capability to create higher consistency in athletic performance.
PSR has been used to increase athletic performance through modeling by increasing self-efficacy and creating an ideal performance state (Bertram, Brown, Guandagnoli, & Palomaria, 2007; Bradley, 1993; Gipson, McKenzie, & Lowe, 1989; Halliwell, 1990; Malroy, 2000; Rymal & Ste-Marie, 2007; Starek & McCullagh, 1999). In addition research has indicated that video is an appropriate medium for imagery interventions and can be more effective than master rehearsal scripts alone (Smith & Holmes, 2004). The advances in today’s video technology can provide athletes with innovative ways to access visual models of successful performance. Highlight video footage or images from an athlete’s best performances of target behaviors have the potential to be one of the most influential models available to coaches and athletes (Ives, Straub, & Shelley, 2002).

Imagery has been shown to be effective in enhancing athletic performance (Driskell, Copper, & Moran, 1994; Feltz & Landers, 1983; Martin, Moritz, & Hall, 1999). The use of imagery by elite athletes and coaches is a testament to its applied effectiveness. Elite athletes employ the use of imagery much more frequently and systematically than athletes of lesser athletic ability (Arvinen-Barrow, Weigand, Thomas, Hemmings, & Walley, 2007; Cummings & Hall, 2002; Salmon, Hall, & Haslem, 1994). Coaches have indicated that they use imagery more than any other mental training technique and felt that imagery was the most useful technique that they used with their athletes (Bloom, Durand-Bush, & Salmela, 1997). Higher-level coaches (international, national, and varsity) were found to use imagery more often than the lower level (recreation and club) coaches (Jedlic, Hall, Munroe-Chandler, & Hall, 2007). While coaches often utilized imagery, its use tends to be fairly unstructured.
Modeling Theories

Martens, Burwitz, and Zuckerman (1976) evaluated the effect of modeling on particular motor tasks in a series of four experiments. The first three experiments involved a control group (CO) as well as three groups that observed different types of filmed models. One group observed a model progressively improving on the task (LSM), a second group watched a video of a model always performing correct tasks (CM), and a third group viewed a model performing incorrectly (IM). A relatively simple motor task was presented to the modeling groups in the first two experiments. Results indicated that the participants in the CM and LSM groups gained information through observation and enhanced performance through the first 10 trials. However, after these initial trials, the modeling did not have a more effective result than the CO and IM groups. The authors suggested the simple cognitive and motor demands of the basic task were acquired within the first 10 trials. Further modification of the skill did not necessitate additional cognitive information (Martens et al., 1976).

The third experiment examined the difference between the same groups except this time a more difficult task was modeled and subsequently attempted (Martens et al., 1976). Results demonstrated that modeling effects were more prominent and maintained throughout all the performance trials in the LSM and CM groups. These first three experiments suggested that observing a filmed model had a clearly positive affect on performance (Martens et al., 1976).

The last experiment sought to answer the question of whether a filmed model has the same effect as a live model (Martens et al., 1976). Participants in this final
experiment viewed a live model that demonstrated the same difficult task that was used in the third experiment. This group was compared statistically to the CM and LSM groups from the previous experiment. Results indicated no significant differences between the effects from observing a live model compared to viewing a video model (Martens et al., 1976).

From the results of this study, combined with post-experimental interviewing, knowledge of observational learning literature, and additional pilot studies, the authors theorized that the observation of a model facilitates performance primarily through transference of information about the cognitive components of the motor skill (Martens et al., 1976).

In addition to the theoretical implications, this pioneering study was important because it demonstrated that modeling improves performance for simple tasks in the short term, and that modeling improves performance on difficult tasks for the long term (Martens et al., 1976). The findings from this study also suggested that a video model is just as effective as a live model (Martens et al., 1976).

Bandura’s (1986, 1997) social cognitive theory elaborates on a variety of the findings postulated by Martens et al. (1976). Social cognitive theory describes how modeling can directly enhance performance behaviors. It also tells of how modeling can affect performance behaviors indirectly by improving the psychological state (Bandura, 1997; Ram & McCullagh, 2003; Rymal & Ste-Marie, 2007).

After a review of the self-modeling literature Dowrick (1999) concluded that in most cases PSR is better suited for skill refinement and to improve rates of performance rather than skill acquisition. He proposed that, “self-observation of an adaptive behavior
increases the probability of future performance of that behavior” (Dowrick, 1999, p. 34).

Modeling may illustrate subtleties of movement precision that had previously gone unnoticed (Dowrick, 1999). For example, when rebounding in a basketball game an observer of a PSR video may see that during successful attempts there is a slight turning of the head to find the opposing player to make solid contact. Another example would be a player that sees that on successful three point shots there is a tendency to extend up and through rather than slightly pushing out. Social cognitive theory suggests that this does not necessarily have to be a conscious discovery (Bandura, 1997). The observer may be encoding the movements through attention which may be transformed during play without thought (Bandura, 1997).

The rate of desired behaviors can potentially increase with PSR by clarifying more precisely which behaviors in which circumstances produces the most effective results (Dowrick, 1999). PSR can also increase the rate of desired behaviors by improving self-efficacy (Bradley, 1993; Dowrick, 1999; Starek, & McCullagh, 1999). Self-efficacy has a major influence on an individual’s behaviors, affect, and cognition (Bandura, 1997).

According to Bandura (1997) there are four sources of self-efficacy, with mastery and vicarious experiences cited as the two strongest sources. In modeling with PSR videos the viewer has a vicarious experience of a mastery task. This is potentially a powerful source for self-efficacy because it draws upon two sources at the same time (Bandura, 1997). PSR serves to influence self-efficacy by reminding the athlete that they have been previously successful at the tasks while concurrently observing movement cues of the model.
Through its positive effect on self-efficacy PSR may also increase motivation and decrease anxiety for the modeled skill (Dowrick, 1999). Perceived competence can be seen as essentially the same as self-efficacy because both involve feelings of personal ability to accomplish a task (Bandura, 1997). Providing positive reinforcement through PSR may help to increase the learner’s feelings of competence, which can lead to increased motivation and decreased anxiety for the skill. Thus, self-modeling can improve performance through self-efficacy. Elevated self-efficacy may also positively impact the learner’s state anxiety and motivation for the skill, which may also contribute to improved performance (Bandura, 1997).

According to social cognitive theory (Bandura, 1986, 1997) modeling is effective when the observer meets the subprocesses of attention, retention, production, and motivation. The viewer must attend to the salient cues of the modeled action by identifying the relevant features of the movement. Once the movements have been attended to the viewer must retain the “mental blueprints” into memory for future recall. The subprocess of production refers to the fundamental need for the viewer to possess the physical capabilities to transform the recalled blueprints into a reproduction of the modeled act. In addition to needing to be physically capable, the viewer must have sufficient motivation to reproduce the observed action (Bandura, 1986, 1997).

Compared to live modeling, PSR offers unique benefits to all four subprocess elements that must be present for modeling to be effective. Modeling similarity is mentioned as an important aspect to the attention subprocess of modeling by theorists (Bandura, 1986, 1997; Dowrick, 1999) and is supported by research (George, Feltz, & Chase, 1992). Similar models are thought to create greater self-efficacy and performance
when compared to dissimilar models. This is because the observer will more likely relate
to a similar model which results in closer attention paid to the modeled behavior
(Bandura, 1997).

PSR offers a distinct advantage over live models in that more attention will likely
be given by the viewer because having oneself as a model would maximize model-
observer similarity. Starek and McCullagh (1999) found that adult novice swimmers
who watched PSR videos performed significantly better than those that watched videos of
their peers' successful performance. It can be argued that increased attention produced
by watching self-models could boost the subprocess of retention because more of the
coded information would likely be coming into memory to be stored.

Production offers the most straightforward advantage for PSR. The ability to
produce the desired task is guaranteed because it is an observation of one’s own
behaviors. As discussed previously, motivation to reproduce the observed movements
can be increased through a lowering of anxiety and by increasing the perceived
competence for the observed behavior through vicarious mastery experiences. PSR
would most likely be more motivating than viewing a live model because viewing one’s
self would have more of an effect on perceived competence (Dowrick, 1999).

Rothstein (1980) developed guidelines for using video as a model following a
meta-analysis of 52 video modeling studies. Rothstein suggested video modeling could
be effective because vision is the dominant receptor of sensory information. Repetitive
replay of the learning sequence was recommended. At least five modeling sessions
containing multiple replays (three or more) of the desired behavior is needed to have an
effect. Multiple replays allow sufficient opportunity for the user to focus on the model
without missing vital aspects of the movement because of the possibility that vital cues were not fully focused on immediately.

In addition, verbal cueing is critical in learning from a video model (Rothstein, 1980). Offering verbal cues before viewing the video model informs the user where to look and what to observe. Furthermore, presenting verbal cues during the viewing focuses the viewer’s attention on the specific information that you would like the learner to symbolically code. Finally, it is advised to physically practice following the modeling session. Physical practice is done to maximize knowledge retention of the modeled behavior resulting in a more effective transfer of skill (Rothstein, 1980).

It is important that the self-model perform the desired skills accurately. Generally, the user will pay more attention, and imitate a model to a greater extent the model is perceived to be competent of the tasks (Gould & Roberts, 1982). The greater the competency of the viewed model, the more likely the observer will pay attention to and imitate the movement behaviors that are being modeled. Increased attention improves the symbolic coding for the viewer. The model must convey a high level of ability, and must demonstrate the desired skill accurately to be effective (Gould & Roberts, 1982).

**Modeling Studies**

Influencing adaptive behavior through modeling is one of the most natural forms of teaching performance techniques. Coaches have long utilized modeling to demonstrate and improve performance. Research has revealed that modeling a physical movement is an effective way to teach movement behaviors (Ashford et al., 2006; Martens et al.,
1976). Statistical significance was found in a meta-analysis designed to measure the effect of modeling versus a practice only condition for both movement dynamics and outcome measures (Ashford et al., 2006).

The emphasis of the current study is on video modeling. Two studies in particular divided participants into groups that either used relaxation and mental training techniques or into a group that used relaxation, mental training, and videotaped modeling (Gray, 1990; Hall & Erffmeyer, 1983).

Gray (1990) studied the effect of videotaped modeling on novice racquetball performance. The participants learned racquetball fundamentals during the first week in two sessions lasting an hour and a half. The second and third week they were randomly assigned to one of two groups. One group practiced progressive relaxation and visual imagery for twenty minutes twice a week. The other group engaged in progressive relaxation and subsequently received instruction from a videotape of professional racquetball player successfully executing forehand and backhand shots. After the two skills were modeled the screen went blank and they were guided through an imagery session. They also practiced twice a week. The forehand and backhand skills were the dependant variables. These skills were measured prior to the first practice session and at conclusion last practice session. While there was not a significant effect on the backhand skills between groups, there was a significant effect on forehand performance, at least for the forehand skill. These findings support the effectiveness of using video modeling for beginning performers.

An earlier study on the effect of video modeling on free throw percentage was conducted by Hall and Erffmeyer (1983) using highly skilled female college basketball
players. The study was conducted over a two week training period. During the first week (five days) all participants received thirty minute training sessions in progressive relaxation and visual imagery. During the second week (five days) all participants practiced progressive relaxation and imagery for the first twenty minutes. During the latter twenty minutes one group was instructed to resume the relaxation and imagery while another group watched videotape of a female basketball player executing ten consecutive foul shots with perfect form. Participants in the video modeling group watched video of perfect form for two minutes and then closed their eyes and imagined themselves making a perfect foul shot. This process was repeated until the twenty minute session concluded. The results of this analysis found a significant difference between the video modeling group and the group that received no video modeling. The results of these two studies (Gray, 1990; Hall & Erffmeyer, 1983) suggested that the use of video modeling could be an effective means to improve performance.

PSR involves observing oneself on video that has been edited to show desired performances. Modeling studies involving PSR videos serve as a basis for this study. When a PSR is produced for a specific athlete, it can be edited to produce exciting and effective visual cues. Anecdotal evidence for the use of PSR came from Ives, Straub, and Shelley (2002) in a review of digital video use in consulting. One of the authors was a consultant who clipped together highlights of successful performances for a division II softball team. The highlights were presented before practices and games to provide a team-wide motivational experience. Video was also viewed individually for personal motivation and visualization. Players and coaches responded positively to these peak performance videos (Ives et al., 2002).
In a review of his own experience as a sport consultant for National Hockey League teams (over a span of 6 years), Halliwell (1990) discussed the concurrent use of music highlight videos and imagery. He constructed the videos by asking players to identify the times they were playing their absolute best. He then gave them a form on which to describe these moments. The form also addressed how they felt and the thoughts that they had during these peak performances. He had the players’ favorite music incorporated into the selected highlight clips. The players would watch and listen to the video before competition. Halliwell (1990) described the use of personal highlight videos as the most effective mental training technique for building and maintaining confidence, consistency, and creating the ideal performance state. He found these music videos to be especially effective for players who were not performing to expectation or returning from an injury (Halliwell, 1990).

In a similar account of their work as sport consultants Gipson et al. (1989) used positive self-modeling in their sport psychology program for the USA women’s national volleyball team. Gipson et al. (1989) edited videotape from practices and matches to produce the tapes. A personalized videotape was made for every player. The video showed each player performing targeted skills properly. Each player would mentally rehearse both with a skill expert present and alone before practices and matches. When viewing with an expert they were asked to describe the critical details of the skill performance. The skill expert would reinforce and elaborate the descriptions when needed. In an effort to specifically increase motivation selected clips from a promotional tape and team footage from previous matches were added to the individualized PSR tapes. These tapes were given to the players before the Olympics to use at their own
discretion before matches. Though the videos were met with positive feedback from players and coaches the authors emphasized that their work was not done within an experimental design (Gipson et al., 1989).

There have been relatively few empirical studies of PSR in the sporting context (Dowrick, 1999). That may be due in part to past difficulties in producing PSR videos. However, PSR has been shown to be effective in enhancing performance (Bertram et. al, 2007; Bradley, 1993; Malroy, 2000; Smith & Holmes, 2004; Starek & McCullagh, 1999).

Reviewing negative performances is commonplace in sports. The theory is that by watching poor performances the observer can recognize the mistake and make the appropriate correction. Bradley (1993) compared free throw performance between a group that watched a PSR video of made free throws and a group that viewed a video of their missed free throws. Results indicated an increase in free throw percentage for the PSR group and a decrease in free throw percentage for the negative self review group (Bradley, 1993).

Starek and McCullagh (1999) investigated the effectiveness of PSR on swimming performance along with self-efficacy and anxiety. Participants were adult volunteers from a college community. Researchers compared the PSR group to a group that viewed video of a peer who was at a similar ability. Each participant took five individual swimming lessons. Results indicated that participants in the self-modeling condition demonstrated significantly better swimming performance by the fourth swim session than participants in the peer-modeling condition. However, they did not find any significant increases in self-efficacy or anxiety. Motivation was not measured, yet the authors
theorized that increased motivation might have influenced the effectiveness of the intervention (Starek & McCullagh, 1999).

Bertram et al. (2007) examined the effectiveness of PSR on golf putting. As a secondary measure they investigated the importance of immediacy of physically practicing or competing after viewing the video. Thirty volunteers where divided into either a control group, a video modeling immediate (VMI) group, or a video model delayed (VMD) group. The VMD group did math problems for two minutes after watching the PSR. Baseline data was taken on ten putts by measuring distance from the hole. During this time a successful putt was also recorded digitally for each player. A week later the VMI and VMD groups watched the PSR of their recorded successful putt five times in succession before taking ten putts while the control condition only putted. This process was repeated another two times with the comparison results being taken from the last 10 putts. The data suggested that watching a PSR immediately before performing the skill significantly improved performance. However, the VMD group failed to reach significance, which further suggested that PSR benefits rapidly decline if the skill is not immediately performed after viewing (Bertram et al., 2007)

Despite the supporting evidence, other studies have not yielded similar results (Ram & McCullagh, 2003; Winfrey & Weeks, 1993). Ram and McCullagh (2003) found that though PSR videos may contribute to increases in serve accuracy in volleyball the results were inconclusive. Further, PSR did not have an effect on serve form or self-efficacy. The five participants of this study were intermediate players recruited from a mid-sized university physical education course. This study used a single-subject design and incorporated a think aloud procedure to investigate thought process during PSR
viewing. The authors noted that self-efficacy might not have increased for each participant because during the PSR, some perceived themselves in a negative way.

Participant four was the only one to increase her self-efficacy. During her exit interview she said she thought she looked better on tape than expected which gave her more confidence when she attempted the skill in competition. The other participants noted negative images even though the PSR videos were intended to promote the opposite. These participants felt that the images seen in the PSR looked worse than the images that they had previously perceived about their ability. Thus, the PSR did not serve as a mastery experience (Ram & McCullagh, 2003). A perceived negative image seems to be a potential drawback for using PSR with intermediate athletes.

A study that particularly served as a foundation for the present study sought to increase the rate of rebounding behaviors in four collegiate basketball players (Malroy, 2000). PSR was combined in a mental training package that included imagery, self-talk, and relaxation. For the imagery portion, each player was given a rebounding scenario for both games and practices. The players would systematically image either a game or practice condition and immediately follow that session by watching a PSR video containing the same cue words that were used in the imagery scenario. A single-subject, multiple-baseline design was used to determine the rate of correct rebounding performance (Malroy, 2000). A relatively unique aspect of this study that made it high in social validity was that the measurements were taken from competition. Comparison between pre- and post-treatment percentages showed that after the PSR video and mental training package interventions were introduced there was a 16.3% mean increase of correct rebounding behaviors across the four players (Malroy, 2000). A 16.3% mean
increase is a considerably large behavior change in rebounding behaviors. This study was important in terms of providing evidence for positively influencing performance behaviors. However, despite the importance that is placed on rebounding, the described training package was far too labor intensive (even with the recent technological advances) for the adjustment of a single behavior to be applicable in an applied sense. It would not be advisable for a consultant or coach to go to such great lengths to improve one aspect of a player’s game performance.

Other studies have also taken results from competition performances. Templin and Vernacchia (1995) also used PSR videos in combination with a mental training package to measure their effect on in-game performance. Five male NAIA collegiate basketball players were used in a single-subject, multiple baseline across participant design. Each player was given a personal PSR videotape of himself performing successfully in game situations. They were instructed to view the tape and were told to imagine themselves performing the skills. They were further encouraged to focus on feeling their body performing the action. Results were measured from regular season games. While the study did demonstrate a 4.7% mean increase in field goal percentage in three of the five participants, the results of this study were largely inconclusive. The authors recommended a more stable measurement process for evaluation of the treatment. There are simply too many variables involved in field goal percentage (Templin & Vernacchia, 1995). Researchers have noted the difficulty in measuring the effects of mental training for the on-court transfer of skills (Starkes & Lindley, 1994). Athlete interviews were performed at the end of the study and all of the players involved felt that
there was real benefit in watching the highlight tape because they felt it increased their confidence and/or motivation.

Rymal and Ste-Marie (2007) also used PSR and took their data from competitive performances. In their qualitative study they had the athletes’ review their best dive of whichever dives they were going to perform in the competition. The divers would review video of those dives three times during the week before competition and just prior to competing. After each competition the diver answered four questions relating to the use of the PSR video. The results showed that the participants found the PSR helpful with planning strategies (51%), self-efficacy (21%), self-satisfaction (14%), goal setting (5%), and causal attribution (3%). This qualitative study suggested that PSR can be beneficial to self-regulatory processes (Rymal & Ste-Marie, 2007).

**Imagery Theories**

The cognitive processes of modeling and imagery are suggested to be quite similar (Feltz & Landers, 1983; McCullagh & Ram, 2000; SooHoo, Takemoto, & McCullagh, 2004). Both have been found to enhance performances through cognitive representations, skill execution, and rehearsal (SooHoo et al., 2004). Studies that have used both modeling and imagery have shown positive effects on athletic performance (Bertram et al., 2007; Bradley, 1993; Malroy, 2000; Starek & McCullagh, 1999). Much of the imagery and modeling studies that show positive performance results are actually studies that may be supporting the use of a combination of both imagery and modeling. Many studies that purport to measure the effects of imagery or modeling solely confound the results by allowing or using both methods. Modeling studies that allow time between
the modeled behavior and measurement cannot ensure that participants are not using that time to image (SooHoo et al., 2004). Furthermore, a review of imagery studies found that half of the studies confounded the imagery intervention with some form of modeling (McCullagh & Ram, 2000).

Given that the cognitive processes and subsequent motor performance enhancements are proposed to be extremely similar between modeling and imagery (McCullagh & Ram, 2000; SooHoo et al., 2004) it is not surprising that the theories that intend to explain how the two processes operate also have commonalities. As discussed earlier, part of what social cognitive theory states is that when modeling the observer encodes the viewed movement information into memory (Bandura, 1997). This allows the user to reproduce that information into the intended acts when appropriate cues present themselves (Bandura, 1997).

Imagery involves re-creating an experience to the extent that the mind interprets the re-creation as a real event (Weinberg & Gould, 2007). Imagery in the athletic context typically takes the forms of visual and kinesthetic. The visual form involve perceptual characteristics and kinesthetic facilitates feelings of the activity (force, bodily sensations, etc.) (Taktek, 2004). Elite athletes are capable of evoking kinesthetic sensations related to the movements to which they are familiar and can use mental imagery to regularize their motor responses (Taktek, 2004). As previously mentioned, the concept of improving the rate of desired behaviors is also theorized to be effected by positive modeling (Dowrick, 1999).

Symbolic learning theory (Sackett, 1934) is a popular theory in attempting to explain the imagery process. According to the symbolic learning theory, systematic
imagery training can enhance performance by allowing athletes to symbolically code imaged responses into the central nervous system which forms mental blueprints for movement patterns. These mental blueprints serve as a guide when the athlete encounters the appropriate environmental cues. Systematic imagery strengthens the mental blueprint, enabling movements to become more familiar and possibly automatic. Upon recognition of relevant cues in a competitive environment the athlete should be better equipped to respond (Weinberg & Gould, 2007).

Support for the symbolic learning theory comes from reviews of literature that have shown that athletes using imagery performed consistently better on tasks that were primarily cognitive (Driskell et al., 1994; Feltz & Landers, 1983). Feltz and Landers (1983) found that the effects of mental imagery on symbolic tasks were greater than the effects on motor or strength tasks. They concluded that the distinction between symbolic and motor aspects of motor skill learning is strong, therefore supporting the symbolic-perceptual hypothesis (Feltz & Landers, 1983).

Bioinformational theory asserts that imagery enhances performance through the brain functionally organizing images into stimulus propositions and response propositions (Weinberg & Gould, 2007). Stimulus propositions portray particular stimulus features (the crowd in the stands, the gym noise, etc) of the imaged scenario. Response propositions are how the imager responds to the imaged scenario. Bioinformational theory places its emphasis on productive responses for the purpose of producing physiological reactions. In accordance to symbolic learning theory, bioinformational theory also suggests that the imaged positive responses are coded into mental blueprints that serve as guidelines for actual competitive situations. According to
this theory imagery should contain both stimulus propositions and response propositions but should contain more response propositions (Weinberg & Gould, 2007). Bioinformational theory is in agreement with the literature that shows improvement to a greater degree through imagery that emphasizes productive responses, as opposed to imagery that focuses just on stimulus characteristics of the situation (Smith & Collins, 2004).

Neurophysiological explanations of imagery may improve understanding of the mechanisms underlying imagery. Jeannerod (1999) verified that during imagery and during similar processes like watching a demonstration on video, selective neural activity was enhanced in motor pathways concerned with the imaged action.

Holmes and Collins (2001) offer a neurophysiological explanation of how imagery works. They theorized that imagery strengthens the memory of motor representation through either conscious or unconscious (or both) memory by decreasing the variability of movements in a similar way of physical practice. Their theory involves the ventral and dorsal brain systems. The ventral system operates consciously and is associated with visual perceptual identification and object recognition. The dorsal system’s function is visual control and is unconscious. The dorsal system has direct connections to the motor areas and is linked to spatial perception. Both systems are connected to memory and therefore may have the ability to transform motor representation into memory (Holmes & Collins, 2001).

Holmes and Collins (2001) proposed that since both the ventral and dorsal systems are needed for effective imagery (imagery involving productive response to the environment) they must be in operation concurrently. The dorsal system is thought to
operate unconsciously out of necessity for the visual perception process of the ventral system to flow without interruption. In this way, visual perception and visual control are separate operations and for imagery to gain maximal use both should be engaged. That is, the environment imaged should be as similar (not just visual, but also feelings and other senses) to the practice or competitive environment as possible to promote use of conscious visual perception. Also, to maximize visual control, which unconsciously stores information into memory, imagery should benefit greatly from visual aids, such as video, that can explicitly show productive responses in imaged environments that are similar to actual competitive environments. Holmes & Collins (2001) suggested “…supporting individual motor imagery with videotaped recordings of performance in familiar training and competition environments should more effectively access the correct motor representations” (p. 72).

It has been argued that the traditional oral delivery of a written script may not be as effective as imagery that utilizes audio or video to supplement the experience (Holmes & Collins, 2001; Smith & Holmes, 2004). Smith and Holmes (2004) theorized that audio and video additions are superior to written scripts because no matter how detailed or realistic the script, it seems unlikely to produce an imagery experience as vivid as an experience that is being presented with the exact the same visual, auditory, or other perceptual cues.

Smith and Holmes (2004) investigated the difference in golf putting performance between imagery that strictly used written scripts and imagery that utilized audiotapes and videotapes. Forty experienced (handicaps less than twelve) golfers were split into four groups. Along with a placebo group that read golf magazines during the time the
others imaged, there was a written script group, a group that used audio for their imagery, and a group that used video. The audio group used sound recordings of themselves making a putt which was replayed fifteen times. Time was given between each replay for the imager to go through a pre-shot routine. The self-modeling group engaged in imagery while watching 15 replays of themselves making a putt. They were told to “step into” the recorded action and physically feel the movements that were being displayed (Smith & Holmes, 2004).

Pretests showed no significant difference in performance between the groups. Posttest results showed that the self-modeling and audio interventions produced significantly greater improvements in both putts holed and putting performance scores than the written script and control group. Furthermore, the video group improved more than the audio group, but the differences were not significant (Smith & Holmes, 2004). This study showed that the form in which an imagery intervention is delivered can have a significant impact on performance effectiveness. It also makes a case for the use of video and audio within imagery training.

Since elite sport is heavily reliant on spatial perception, Holmes and Collins (2001) argue that the majority of visual information processed during competition is through the dorsal system. This would explain why athletes usually cannot recount the specific visual events of outstanding performances. They are partly relying on their unconscious spatial memories during competition. Holmes and Collins (2001) go on to argue that sport consultants’ traditional use of strictly written or verbal imagery mainly directs the information processing to the ventral system for a conscious experience. Subsequently, consultants are only addressing a portion of what imagery can accomplish.
It is increasingly recognized that cognitive and perceptual skills differentiate high-level performers from lower level performers. It is known that elite athletes have large stores of memory that form an extensive knowledge base which enables a high ability to make correct decisions (Starkes & Lindley, 1994; Tenenbaum, Stewart, & Sheath, 1999).

Context-specific and procedural knowledge make up the memory stores that are most beneficial to athletes. Elite athletes have huge stores of context-specific knowledge, which is defined as the memory that enables understanding of their particular sport and its game structure (Starkes & Lindley, 1994). They also have an abundance of procedural knowledge, which allows them to know how and when to perform particular moves (Starkes & Lindley, 1994). These athletes also have more connections among their memories allowing them to access and recover information quickly (Starkes & Lindley, 1994). Thus, elite athletes tend to make better decisions by using their extensive knowledge base to rapidly and accurately retrieve appropriate previous experience to facilitate faster and more accurate interpretation of stimuli present in game situations. This knowledge base is formed through deliberate practice and exposure to similar situations in the past (Tenenbaum et al., 1999). Proper mental skills training such as imagery and PSR can provide athletes with the tools to create polysensoral (the use of all senses) images of desired experiences that may theoretically enhance their knowledge base.
Imagery and Athletic Performance

Imagery has received a great deal of empirical attention by sport psychology researchers over the years. Feltz and Landers (1983) performed a meta-analysis by combining all imagery studies for the purpose of integrating their findings. The only criterion was the study had to have a group that only received imagery training and this group had to either have pretest scores or a control group for comparison. Effect sizes were calculated by dividing the difference between the means of the treatment and control groups, or pretest and posttest scores, by the within-group standard deviation. Sixty studies were investigated which contained 146 effect sizes. The average effect size of .48 suggested that imagery training is better than no training at all. Feltz and Landers argued that mental practice helps focus attention on the relevant aspects of performance, thus occupying attentional capacity and reducing the risk that attention will be directed toward irrelevant or distraction cues (Feltz & Landers, 1983).

In a more recent meta-analysis, Driskell et al. (1994) also concluded that imagery training was effective in enhancing performance. A difference between this meta-analysis and the one done by Feltz and Landers’ (1983) was the criterion used for the reviewed studies. Feltz and Landers did not exclude studies that involved multiple interventions or poor research design. Driskell et al. specified that the included studies must compare the performance of participants who used imagery training with participants who did not practice at all. This was to give a clear examination of the effects of the imagery training. The results of Driskell et al.’s meta-analysis indicated that imagery training was better than no training at all, but it was not as effective as
physical training. The authors noted that it was not surprising physical practice is better than imagery because of imagery’s inability to provide visual or physical feedback.

Through the meta-analysis Driskell et al. (1994) also examined the conditions in which imagery was most effective. The use of imagery to improve performance of cognitive tasks was compared to its impact on physical tasks. Imagery training was more effective the more the task required cognitive activities. Both cognitive and physical performance is improved with imagery training. However, the effect of mental practice is significantly stronger the more a task involves cognitive operations (Driskell et al., 1994).

The importance of the time between imagery intervention and physical training (measured by number of days) was explored (Driskell et al., 1994). The most effective results came within the shortest interval period (within the same day or when performance was tested immediately after the imagery session). On average, the imagery effect was cut in half after 14 days. The effect of the training fell below the .10 level after 21 days (Driskell et al., 1994). The importance of the immediacy of physical action is in accordance to the Bertram et al. (2007) study and Rothstein’s (1980) guideline of practicing modeling behavior immediately after the session. A negative relationship was found between the length of the training program and the degree of effectiveness of the imagery intervention. In other words, the positive effect of mental practice on performance fades over time. To gain maximal benefits, the imagery routine should be refreshed with new material every 1 to 2 weeks (Driskell et al., 1994). Previous PSR research that failed to find significant effects theorized that a reason for that might have been because video was not updated (Winfrey & Weeks, 1993).
**Imagery Studies**

Imagery training is effective in enhancing athletes’ performance of sport skills (Driskell et al., 1994; Feltz & Landers, 1983; Martin et al., 1999). Kendall, Hryeniko, Martin, and Kendall (1990) investigated whether a combination of imagery, relaxation, and verbal cues could improve a basketball defensive skill. They were interested in examining if the treatment package would have an effect on cutting off the baseline in a game situation. A single participant, multiple baseline across individuals design was used with four female college basketball players. Each of the four players were taught the mental training techniques over a five session period. These techniques were used to create an audio cd to which the players listened to every day for the remainder of the season. A performance baseline was established within the first seven games and compared to the post-treatment games. The task of cutting off the baseline was assessed from game film. The average of the mean scores for correct trials during the previous six games was 55.3%. The average of the mean scores post-treatment among all four participants was 73.7%. All of the participants showed a distinct increase in performance. There was a clear immediate performance increase across all participants (Kendall et al., 1990).

Meyers and Schleser (1980) used relaxation and imagery as a coping strategy to improve the scoring performance of a NCAA basketball player. The player sought the researchers mid season to improve performance. A session and a half was used for assessment and the final five and a half were used to implement imagery training. The resulting seven post-intervention games were compared to the previous seven games.
The participant’s scoring increased from 11.3 to 15.3 points per game. Significant increases were also observed in field goal percentage (42 to 65.6%), field goals made per game (3.6 to 6.4) and percentage of total team scoring (13.2 to 22.9%). This case study suggests that relaxation and positive imagery training may contribute to improved performance. However, the multitude of variables in an open sport such as basketball make it difficult to discern whether the results were due to actual performance or varying conditions (Meyers & Schleser, 1980).

Imagery training has shown to not only improve performance, but also to heighten psychological aspects such as self-confidence. Callow, Hardy, and Hall (2001) used a multiple-baseline across-participants design to measure the effect of imagery training on confidence among four high-level badminton players. State Sport Confidence Inventory (SSCI) was used to measure confidence. Along with visual inspection, binomial statistical testing indicated that motivation was significantly increased in two of the participants, and decreased in another. The post-experimental interview with the latter participant coincided with the result of a decrease in confidence. The participant stated that the reason for the decrease in confidence could be because he or she was playing against better players. The last participant’s motivation did increase, but it was not considered significant. The participant was said to have shown a delayed increase. The authors noted that since the treatment was introduced latest to this participant, when interpreting the results, one should consider that there were only 10 data points in the post-intervention phase which increased the likelihood of a type II error (Callow et al., 2001).
Another possible imagery training benefit that lies within the psychological realm is an increase in motivation. Martin and Hall (1995) conducted a study to find if imagery training could improve intrinsic motivation. Thirty-nine participants who had never played golf, were randomly assigned to either a group that trained with performance and outcome imagery, a group that trained with performance imagery only, or a control group. All the groups were taught how to putt in the first three sessions. For the last three sessions, all the participants were told that the study was designed to test performance on certain golf tasks.

Participants who systematically engaged in performance and outcome imagery training (imaging the ball being sunk into the hole) were found to spend significantly more time practicing the tasks than the control group. They were also found to have set more realistic goals for themselves, have a better perspective on expectations, and were more likely to follow the training program on their own. Participants in the group using only performance imagery training (imaging only their swing) also reported to have used the program outside the laboratory more often than the control group, but their confidence was not found to be significantly greater than the control group. Furthermore, the performance and outcome imagery group set higher goals and showed greater motivational levels than the performance imagery group. This suggests that imagining the outcome of the goal may have a stronger effect on cognitive factors, such as effort and motivation, than only imaging the technique (Martin & Hall, 1995).

Imagery may also increase cognitive abilities such as visual search. Jordet (2005) used a single subject, multiple baseline across participants design to explore the effects imagery could have on the perception of three elite soccer players. The design of the
study allowed the imagery program to be personally modified to each player. The imagery program had the players systematically imagine that they were visually exploring their surroundings prior to receiving the ball in a game situation with the intention of detecting opportunities for actions with the ball. Each player met with the researcher, an experienced soccer coach and sport consultant, and went through imagery training once a week for 10-14 weeks. The athletes were also encouraged to train by using a CD at least an additional one time a week. The results indicated an apparent increase in visual exploratory activity in contests for two of the participants. One of the participants only marginally improved his performance with the ball (Jordet, 2005).

In a review of the literature regarding perceptual-cognitive expertise, Williams and Ericsson (2005) concluded that expertise is much more dependent on hours of deliberate practice rather than talent or maturation. If utilized properly, they concluded that decision-making could be enhanced by a re-creation of the performance environment using video. They suggested effective use should include proper instructional cues along with subsequent physical practice (Williams & Ericsson, 2005).

Single-Subject, Multiple Baseline Design

Single-subject research designs offer several advantages over group designs for research in sport psychology. In a single-subject design the effect of an intervention can be assessed in a way that might normally be masked in traditional group designs (Hrycaiko & Martin, 1996). Because group designs look at averages of the group, individual differences or changes that occur are not able to be evaluated. Single-subject design research involves repeated data collection over many practices or games. Thus,
individual variability can be studied and the true effects of an intervention on a participant can be evaluated (Hrycaiko & Martin, 1996).

Single-subject designs enable researchers to observe significant effects in an applied sense, rather than attempting to produce statistically significant results (Shambrook & Bull, 1996). When using conventional group designs and statistical analysis, it is unlikely that significant results will be apparent for experienced athletes. Expert athletes have less room for improvement than beginners. A slight change in performance might not be considered statistically significant in a group study, but may have a high level of importance to the individual or coach (Shambrook & Bull, 1996).

Another advantage of single-subject designs is that large sample sizes are not needed to draw statistical conclusions. Single subject designs typically include three to five participants. Large sample sizes needed for group comparisons are not conducive to sport, especially if results are to be taken from game performances (Shambrook & Bull, 1996).

Additionally, in a single-subject design every participant receives the treatment at some point. This is advantageous in a team environment because there is no need to withhold the treatment from a control group (Hrycaiko & Martin, 1996).

Single subject research designs also evaluates the practicality an intervention by emphasizing social validation (Hrycaiko & Martin, 1996). Social validation is assessed by administering a questionnaire to the athletes at the end of the study that inquires about the methods used and the results. Social validity can be attained by including questions that ask if the target behaviors presented in the intervention are important to the
individuals, was the behavior change large enough to be considered significant to the athletes, and if they considered the procedures acceptable (Hrycaiko & Martin, 1996).

In a multiple-baseline design effects are demonstrated by introducing the intervention to different baselines at different points in time (Kazdin, 1982). Observing and recording a subject’s behavior for several sessions prior to the introduction of the intervention establishes a baseline level of performance. Baseline information is taken to help predict performance in the immediate future (Kazdin, 1982). It gives the ability to estimate where future data point might fall if conditions were to stay the same. If each baseline changes positively when the intervention is introduced, the effects can be attributed to the intervention. With this staggered baseline approach there is more precision in ruling out alternative hypotheses and making causal interpretations of the data than if the intervention was introduced to everyone at the same time (Kazdin, 1982).

Visual inspection of the data points is the primary evaluation method for single-subject designs (Kazdin, 1982). Visual inspection refers to reaching a judgment about the configuration or consistency of intervention effects by visually examining the graphed data. The number of sessions is plotted on the horizontal axis and the frequency of behavior is plotted on the vertical axis (Kazdin, 1982).

A few guidelines beyond visual inspection are proposed to determine whether a treatment has had an effect (Hrycaiko & Martin, 1996). The first guideline is that the last few data points of the baseline should be reasonably stable or in a direction opposite to what is predicted as the effect of the intervention. The intervention can be implemented at the choice of the experimenter. This helps ensure that a relative stabilization of the baseline is had before the intervention is introduced (Hrycaiko & Martin, 1996).
High variability within and between the pre- and post-intervention phases makes it difficult to discern effect. One has greater confidence that an effect has been observed when there are few overlapping data points between the two phases (Kendall et al., 1990). In an open-skilled sport such as basketball there are numerous uncontrolled variables that can impact player production. A better evaluation may be to calculate the size of effect after the intervention is introduced. This is accomplished with a calculation of the baseline mean and subtracting it from the post-intervention mean (Kazdin, 1982).

Immediacy of effect is also suggested as a guideline to verify effect. One has greater confidence that an effect has been observed the sooner the effect is observed following the introduction of the intervention (Shambrook & Bull, 1996).

**Win Score Measure**

Win Score (Berri, Schmidt, & Brook, 2006) is an equation that is based on offensive and defensive efficiency. Offensive and defensive efficiency is measured by dividing points scored (or allowed) by the number of possessions in a game. Through fifteen National Basketball Association (NBA) seasons of aggregate regular season team data these two factors explain 94.1% of the variation in team winning percentage (Berri, 2008). Through a sophisticated method involving regression analysis, Berri et al. (2006) made a determination on which statistics are factors connected to offensive and defensive efficiency and the value of each of those statistics in regards to both measures of efficiency. The resulting equation (Win Score) is as follows: Total points + total rebounds + steals + ½ blocked shots + ½ assists – field goal attempts – free throw attempts – turnovers – ½ personal fouls (Berri et al., 2006). This is a simplified model.
For example a blocked shot was determined to reduce the made two point shots by the opponent by -.58. However, blocks were rounded off to -.5 for the sake of simplicity (Berri et al., 2006). This was done for each of the statistics. A comparison between the actual values and the simplified Win Score model revealed a 0.99 correlation coefficient. In other words, both assessments of players are essentially the same (Berri, 2008).

The accuracy of Win Score was measured by taking the summation of the wins produced by each team’s players, according to the Win Score formula, and comparing the results to actual wins (Berri, 2008). Berri (2008) calculated the absolute difference between these two values from the 1993-94 season to the 2004-05 season and found an average difference of 2.4. In sum, a team’s wins production according to Win Score is tied quite closely to actual wins (Berri, 2008). Berri et al. (2006) argues that the Win Score model is an improvement to the National Basketball Association’s (NBA) efficiency rating because Win Score indicates how much a player is contributing towards a win rather than an accumulation of statistics.

Berri (2008) proposed that Win Score is “…appropriate if you are comparing a player relative to himself or to other players playing the same position. In other words, if you are doing a study of how player performance changes over time, or what factors impact player productivity, Win Score is appropriate” (p. 19). Because the primary focus of this study is to measure player performance change over time Win Score is an appropriate measure. However, it is important to note when making evaluations of the results of this study that player production differs slightly between the positions. For instance, it is easier for post players to accumulate rebounds which are worth a full point each while assists are easier for guards to attain but only worth a half a point.
Berri made the determination that his NBA model is appropriate for collegiate statistics because collegiate teams score at about the same rate as NBA teams (about 1.0 points per possession) (D. J. Berri, personal communication, September 29, 2008). Each player’s Win Score was calculated for each game they played. The Win Score was adjusted for playing time by dividing forty by the number of minutes played and multiplying the dividend by the Win Score. This was done to standardize scoring between games of varying minutes played. Win Score was calculated by the researcher.

Summary

The use of modeling and imagery as effective learning tools to enhance performance is well supported (Ashford et al. 2006; Dowrick, 1999; Driskell et al., 1994; Feltz & Landers, 1983; Gould & Roberts 1982; Martin et al., 1999). Cognitive processes of modeling and imagery are said to be similar (Feltz & Landers, 1983; McCullagh & Ram, 2000; SooHoo et al. 2004). Psychological factors such as cognitive abilities (Jordet 2005), self-efficacy/self-confidence (Callow et al. 2001; Martin & Hall, 1995), and motivation (Martin & Hall, 1995) may be additional beneficial factors of using modeling and imagery. Social cognitive theory (Bandura, 1986, 1997) will provide the theoretical foundation for modeling. This study will also draw upon neurological explanations (Holmes & Collins, 2001) for imagery along with symbolic learning (Sackett, 1934) and bioinformational theory (Weinberg & Gould, 2007).

PSR is a sub-classification of modeling that provides a recurring self-model of successful performance that can be used to improve performance (Bertram et al., 2007; Bradley, 1993; Dowrick, 1999; Malroy, 2000; Ram & McCullagh, 2003; Rymal & Ste-
Marie, 2007; Smith & Holmes, 2004; Starek & McCullagh, 1999; Templin & Vernacchia, 1992). Positive anecdotal evidence on the use of self-modeling in the field of sport is a testament to its applied effectiveness (Gipson et al., 1989; Halliwell, 1990; Ives et al., 2004).

Particular guidelines should be adhered to for the modeling to be effective (Gould & Roberts, 1982; Rothstein, 1980). Verbal cueing is critical for directing attention to a video model (Rothstein, 1980). Viewing the modeled sessions multiple times is essential (Rothstein, 1980). Also, it is necessary that the model perform the desired skills accurately (Gould & Roberts, 1982). Finally, increased effects are seen when modeling is closely followed by physical performance (Rothstein, 1980).

Video modeling offers unique benefits over live modeling by maximizing model similarity and increasing perceived self-competence, attention, and retention (Dowrick, 1999). The case for the use of video is further enhanced in studies that have found that the information presented in modeling is equally effective for the observer whether modeling is done by a live demonstrator or on film (Martens et al., 1976). Thus, self-modeling videos can provide a strong successful modeling image that is easily reinforced or strengthened simply by watching the video repeatedly.

Innovative modeling designs that include the use of video to combine imagery and modeling have shown to be effective in improving performance (Gray, 1990; Hall & Erffmeyer, 1983; Malroy, 2000; Smith & Holmes, 2004). Unlike traditional imagery, a combination of self-modeling and imagery provides images of successful performance that is not solely composed from verbal descriptions of situations or events, but from actual footage of the athlete being successful. The athlete views successful performances
and, supplemented by imagery training, can learn to mentally recreate those moments to increase the rate of behavior, skill refinement, goal clarification, appropriate responses for particular circumstances, self efficacy, motivation, and to reduce anxiety. In essence, these factors can be brought together as different ways to contribute to the learning by observation of one’s own behavior. Research regarding imagery modality suggests that imagery aided by video and audio may be more effective than imagery that is read from a script (Smith & Holmes, 2004).

A growing body of research has explored the effects of imagery and/or modeling interventions on game performances (Jordet, 2005; Kendall et al., 1990; Meyers & Schleser, 1980; Malroy, 2000; Rymal & Ste-Marie, 2007). Analyzing effects on game performances is important for the applied aspect in the field of sport psychology because of its high external validity. Improved game performance is the ultimate goal of sport psychology. A common limitation to much of this research is the measurement of the dependant variable. Taking measurements from athletic contests is difficult due to the multitude of confounding variables. This study sensitized the performance measurement by incorporating multiple measures of production with a Win Score (Berri et al., 2006) efficiency rating rather than a single measure such as field goal percentage.

Single-subject designs are appropriate for sport psychology studies. Such designs allow evaluation of slight changes that are important to elite athletes and does not mask results in group averages. Single-subject designs are also advantageous in that large sample sizes are not needed, results can be easily taken from competition, and social validation is emphasized for practicality.
CHAPTER III

METHODS AND PROCEDURES

Introduction

The purpose of this study was to determine the effect of a combination of imagery and positive self-review (PSR) on the overall performance of four male intercollegiate basketball players. A secondary purpose was to investigate the social validity of the treatment through a post-experimental questionnaire and to investigate the practicality of using a hand-held digital media application.

Immediacy of physical activity following modeling or imagery is an important factor in enriching athletic performance (Driskell, Copper, & Moran, 1994; Rothstein, 1980). However, elite athletes generally have ritualistic pre-game routines that occur just prior to game time. Consequently, a dilemma has presented itself for those who desire to implement an imagery or modeling intervention before competition to enhance performance. Should the intervention be somewhat invasive (taking the athlete to another room and out of normal element) and be presented just before competing or should it be conducted before the athlete’s pre-game routine and risk a lesser effect due to a lack of immediacy? If the later option is chosen, away games become difficult if not impossible to administer a treatment because there typically is not time between travel and the athlete’s pre-game routine. This study sought to eradicate this problem by using a hand-held digital media application during sessions that were close to the start of a
game. This relatively new video application could possibly allow the athlete to integrate the intervention seamlessly into a pre-game routine, regardless of the location of the competition.

A single-subject, multiple baseline across individuals research design was used to determine the effect of the treatment (Kazdin, 1982). Single-subject research designs demonstrate effects by introducing an intervention to different baselines at different points in time (Kazdin, 1982). If the baseline changes when the intervention is introduced across all the participants, the effects can be attributed to the intervention rather than extraneous events (Kazdin, 1982). This design was implemented for an entire season to examine the effects of imagery and self-modeling on actual performance of elite basketball players in competitive situations.

Description of Study Population

Participants consisted of four male National Collegiate Athletic Association (NCAA) division II players who were members of the 2009-2010 Western Washington University men’s intercollegiate basketball team. The participants where all Seniors that ranged in age from 20-23 years old. The participants were the starting point guard, off guard, power forward, and center. Referred

The head coach of the team granted permission to employ his athletes as participants for this study. An informed consent was distributed to, discussed with, and signed by each participant. A copy of this form is in Appendix A.
Design of Study

A single-subject multiple baseline across participants research design was used to evaluate the treatment effect. The independent variable was a positive self review and imagery intervention, which used digital video highlights displayed on a hand-held digital media application. The dependent variable was the Win Score (Berri, Schmidt, & Brook, 2006) efficiency rating.

Data Collection Procedures

Instrumentation. A Dell Latitude E6400 laptop computer containing a DVSport editing system software was used to create and order the video clips for the self modeling videos of each player. The original video came from the previous and current season’s game films that were shot with a DCR-DVD850 DVD Handycam video camcorder during home games and from various camcorder models from video that was taken by opposing teams. Windows Movie Maker was used to add transitions and music to the PSR videos. Each video was 10 minutes in duration. See appendix B for a detailed overview of the construction of the PSR. After the four videos were created they were imported to four First Generation Apple iPod iTouch 8 GB digital players.

A First Generation Apple iPod Touch 8 GB digital player was used as the application device for each participant. The iPod Touch was selected because of its capability to import video, its video clarity, and size. The screen measures 2 inches in height and 3 inches in width. The device itself is ¼ inch thick, 2 ¼ inches in height, and 3 ½ inches wide. The device’s small size and relatively large screen was seen as an advantage in portability and ease of recognition for viewing.
At the completion of the last game of the season each participant also filled out a questionnaire pertaining to the social validity of the study. Researchers have suggested social validity as an important aspect of single-subject designs (Kendall, Hryeniko, Martin, & Kendall, 1990). A copy of the exit questionnaire is in Appendix C.

Positive self-review video production. Each video was personally tailored to illustrate repeated appropriate target behaviors for each player involved in the study. Each target behavior video segment contained the athlete executing a particular skill correctly multiple times in varying conditions. Behavior that led to the desirable outcome was the focus of the target behaviors. Clips were selected based on technique and outcome of the play. The selected target behaviors were reflective of the Win Score formula (Total points + total rebounds + steals + ½ blocked shots + ½ assists – field goal attempts – free throw attempts – turnovers – ½ personal fouls) (Berri et al., 2006). Accordingly, every PSR video contained successful field goal attempts, offensive and defensive rebounds, and assists. Target behavior selection was also influenced by importance in production by position. For example, the PSR video made for the starting point guard placed a greater emphasis on passing because passing is of higher importance for that position. The PSR videos that were created for the guards did not show blocked shots because of the rarity in which these opportunities occur. Similarly, the PSR videos made for the post players did not contain footage of steals. Every two weeks the videos were “refreshed” by adding two new clips to each target behavior and simultaneously taking out two clips of older footage. Typically footage from the earliest games were replaced. This was done to keep the participants’ interest. Each video was 10 minutes in length.
Music that was thought to be motivating and enjoyable was selected by each player to integrate into the videos (Halliwell, 1990). Windows Movie Maker and its voice-over feature was used to insert a black screen that contained audio segments of each athlete giving his own personal verbal cues. The researcher wrote up relevant cues for each athlete and subsequently edited these cues with the athletes themselves. The athletes gave input on what they wanted to keep, discard, or change. These cues were intended to direct the athlete’s attention to particular behaviors that were shown in the subsequent clips. These “transitions” were placed between every target behavior. The music was faded out at the beginning of the transition and faded back in at the end. See appendix D for the complete scripts of the audio segments.

Discussion of measurement techniques and procedures. The treatment was administered over three consecutive days preceding the game in which the intervention phase would begin. On the first day the experimenter gave a brief description of imagery. The PSR digital video recording was introduced and instruction was given regarding how to use it concurrently with imagery. The PSR video was viewed on a 50 inch television screen. The athletes were instructed to mentally “step into” the video and try to feel the movements relating to the video footage as if they were actually physically performing the movements of the skills. After the intervention was introduced the experimenter had the participant repeat two practice trials and encouraged the athlete to ask questions. On the second day the experimenter met with the player and briefly gave a review of the program’s use and had the athlete review the video twice. On the third day the same process as the day before was repeated. In addition, instruction was given on
how to use the Apple iPod Touch, when to use the intervention for home and away games, and on how to complete the logbook that was intended to ensure adherence.

Selection of players were made based on playing time. Each participant had to average a minimum of 25 minutes per game. The 25 minute criteria was select by the researcher to protect against very high or low outcome scores which are more prevalent in short amounts of playing time. Data was taken from regular season and playoff games. Baseline data was collected for each player beginning with the first regular season game. Pre-season games and games that were played against a lower division opponent were not used for baseline data. Implementation for participant #1 began between the ninth and tenth game because the five games previous to the tenth game where held out of state which the experimenter did not attend. Participants were not included in the study if more than three games following the implementation of the intervention were missed or if more than seven games total were missed.

The treatment was applied to the participant with the most stable pre-treatment data and/or after a downward trend (Hrycaiko & Martin, 1996). Implementation of the intervention was given to athlete #1 between games 9 and 10. Subsequent interventions were introduced in a staggered manner to the other players every three games. Athlete #2 was introduced to the intervention between game 12 and 13, athlete #3 between game 16 and 17, and athlete #4 between game 20 and 21. Continuation of data collection was made for the remainder of the season.

Every game after the initial intervention was held on either a Thursday or a Saturday with most weeks having games on both days. As a result of this schedule each participant was required to use the intervention every Monday, Tuesday, Wednesday, and
Friday, and twice on game days. On the four non-game day sessions the athletes went through the training session in their own time in the evening. If the circumstance was such that they did not have access to a quiet setting the session was held after practices in the team room. On game days (after the intervention was introduced) each participant went through an imagery and PSR session after the morning shoot-around and just prior to taking the court for warm-up shooting (approximately forty minutes before the start of the game). The participants filled out logbooks after each game and after every non-game day session to ensure adherence. An example of a game day and non-game day logbook sheet is in Appendix E.

Data collection. Player performance was measured by an efficiency measure for productivity called a Win Score (Berri, Schmidt, & Brook, 2006). For every game a Win Score was tabulated for each participant. Win Score was developed by Berri et al. (2006) to measure a basketball player’s productivity.

The Win Score metric was presented to head coach Brad Jackson by the experimenter to determine its validity. Coach Jackson responded positively to the idea of using a measure that can show how valuable a player’s performance can be towards winning a basketball game. He thought the formula was relevant to player performance and was composed of statistics that were relevant to the behaviors that he teaches in practice.

Pre and post intervention statistics for points, total rebounds, steals, blocked shots, assists, field goal attempts, free throw attempts, turnovers, and personal fouls were kept by Paul Madison, sports information director (SID) for Western Washington University.
These statistics were used to calculate the Win Score for each regular and post season game for each participant of this study.

According to Madison the recording of statistics in the NCAA is very standard and accurate. Every game is video streamed and can be monitored for accuracy if need be. If there was any reason that Madison thought the statistics were not taken correctly he uses a relatively simple method to check for accuracy. He subtracts made field goals from the shots attempted (for both teams) and that number should equal the total amount of team rebounds plus the total amount of individual rebounds (again for both teams). If that number is not the same he will view the video from that game make the necessary corrections.

The Win Scores were calculated and saved on an Excel spreadsheet. This process was conducted on the Dell Latitude E6400 laptop computer containing the DVSport software.

**Data Analysis**

Each athlete was represented by a graph with the number of games comprising the horizontal axis and Win Score the vertical axis. In addition to monitoring overall Win Score performance, the positive (shots and free throws made, assists, blocks, rebounds) and negative statistics (turnovers, shots missed, free throws missed, fouls) were graphed separately. This was done to provide a more sensitive measure on the effect of the treatment. If an overall effect on Win Score performance was seen this additional information may provide insight on whether it was due to an increase in positive behaviors, decrease in negative behaviors, or both.
The traditional method of analysis for single-subject, multiple baseline design studies is visual inspection through graphical presentation. The intervention was marked with a vertical line that showed when the treatment was started. Comparisons were made between the data points in the baseline phase and those in the intervention phase. Many times obvious changes in behavior can be observed through this method. The impact and effectiveness of the intervention was analyzed and discussed for each individual and as a whole.

Several factors were examined when looking at the graphical representations of the data. The Win Score medians of the baseline and post-treatment were compared to determine the size of the intervention effect. The mean was determined by finding the Win Score average for each phase. The medians were marked with a dotted horizontal line. The larger difference between the two phases, the more impact the intervention is believed to have had.

The immediacy of effect was examined by calculating the average of the five scores prior to treatment and the five observed performances immediately following the intervention. If there was an increase then an experimental effect had been demonstrated. Lastly, replication across participants was evaluated by examining the data to determine that the intervention produced a similar change in behavior among all the participants.
CHAPTER IV
RESULTS AND DISCUSSION

Introduction

The purpose of this study was to examine the effects of imagery and positive self-review on the performance of intercollegiate basketball players. An iPod Touch was employed for the participants to watch their personal performance enriching self-review video. A single-subject multiple baseline across study participants research design was utilized in this study to evaluate the pre- and post-treatment assessment of the participants’ performance. Player performance was assessed by the Win Score efficiency measure for basketball productivity (Berri, Schmidt, & Brook, 2006). Graphical analysis of the data illustrated the changes in the athletes’ performance. Differences in pre-treatment and post-treatment percentages were compared to determine the influence of the intervention on performance.

Data Interpretation

The results indicated that the imagery and positive self review intervention had a positive effect upon the performance for all four athletes. Each of the four participants showed an increase in the mean Win Score percentage following the introduction of the intervention. Due to the large amount of variability within and across the baseline and
intervention stages, mean percentages were used to measure and evaluate performance outcomes.

Mean percentages of the Win Score measure was compared to analyze two important aspects of this study. The first measurement aspect of this study was the size of effect. Size of effect was determined by comparing the mean Win Score percentage in the pre-treatment (baseline) phase with the mean Win Score percentage in the post-treatment (invention) phase. The second measurement aspect of this study was immediacy of effect. This aspect was determined by comparing the mean Win Score percentage in the last five games of the baseline phase with the mean Win Score percentage in the first five games of the intervention phase. Replication across participants was also evaluated by examining the data to determine that the intervention produced a similar change in behavior among all the participants.

In addition to monitoring overall Win Score performance, the positive (points, assists, blocks, rebounds) and negative aspects (turnovers, shots missed, free throws missed, fouls) of the Win Score was graphed separately. This was done to provide a more sensitive measure on the effect of the treatment.

**Group Comparisons**

Visual inspection of the data alone does not indicate a clear increase in overall performance for the athletes. The variability of the data points prohibits drawing strong conclusions from visual inspection only. Due to the nature of the sport, variability of data points was anticipated. In order to compensate for the variability in the data points,
Figure 1: Graphs of each of the four athletes’ Win Score. Vertical line is when treatment was implemented.
Table 1
*Size of Effect Using Means*

<table>
<thead>
<tr>
<th>Athletes</th>
<th>1 (point guard)</th>
<th>2 (off guard)</th>
<th>3 (power forward)</th>
<th>4 (center)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline/Pretreatment (# of Games)</td>
<td>9</td>
<td>12</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Mean Win Score</td>
<td>7.48</td>
<td>9.76</td>
<td>6.88</td>
<td>4.94</td>
</tr>
<tr>
<td>Intervention/Post-treatment (# of Games)</td>
<td>19</td>
<td>16</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Mean Win Score</td>
<td>8.59</td>
<td>10.58</td>
<td>7.53</td>
<td>5.32</td>
</tr>
<tr>
<td>Change in Means</td>
<td>+1.11</td>
<td>+.82</td>
<td>+.65</td>
<td>+.38</td>
</tr>
</tbody>
</table>

Comparison of the mean Win Score percentages was used to better determine the effect of the intervention.

There was an average increase in Win Score percentage of .74 across all four athletes (see Table 1). The largest increase between baseline and intervention phase was demonstrated by participant #1’s mean improvement of 1.11. The smallest mean increase was displayed by participant #4 at .38. It is important to note that the athlete that participated in the intervention the longest also demonstrated the most improvement, and the athlete whose intervention phase was shortest improved the least amount. In addition, the athletes that participated the second and third longest made the second and third best improvements respectively.

The immediacy of the intervention was slight, with three of the four participants having a positive effect (see Table 2). Athletes 2, 3, and 4 showed an average increase of Win Score average of 1.4 between the last four games of the baseline phase and the first
Table 2

*Immediacy of Effects Using Means*

<table>
<thead>
<tr>
<th>Athletes</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last 5 Games of Baseline/Pretreatment Mean Win Score</td>
<td>7.7</td>
<td>11.2</td>
<td>4.4</td>
<td>.6</td>
</tr>
<tr>
<td>First 5 Games of Intervention/Post-treatment Mean Win Score</td>
<td>5.2</td>
<td>13.1</td>
<td>5.0</td>
<td>2.4</td>
</tr>
<tr>
<td>Change in Means</td>
<td>-2.5</td>
<td>1.9</td>
<td>.6</td>
<td>1.8</td>
</tr>
</tbody>
</table>

four games of the intervention phase. Athlete 2 demonstrated the largest immediacy effect with a 1.9 increase in mean win score. Athlete 1 exhibited a negative trend in performance between the two phases. Interestingly, he displayed the largest overall increase in mean Win Score.

Across the four athletes there was a .45 mean increase between the last five games in the baseline phase and the first five of the intervention phase (see Table 3). The mean .45 immediacy effect increase, when compared to the overall .74 increase, also seems to suggest that the longer the athlete uses the application the more of an effect it is likely to have.

Measurements of positive and negative statistics were also compared for additional information on the effect of the intervention (figure 2). This comparison indicated that the Win Score measure was most likely due to changes in positive outcomes, negative outcomes, or both. The positive and negative statistics are closely related to the Win Score measure, but are not exact measurements of Win Score. In other words, if one were the add the positive and negative statistics together a precise Win
Score would not result. The reason for this is because not every Win Score statistic is only positive or negative. Attempted field goals and attempted free throws are neither completely positive or negative because the outcome can be either. Thus, successful field goal attempts were counted as positive statistics and misses were counted as negative statistics. Another slight variation to the Win Score is that no differentiation is made between two and three point field goals in the tabulation of the made and missed shots. The goal of looking at the negative and positive differences was to obtain a somewhat rough estimate of how the intervention affected the athletes in those areas.

As it was for the Win Score results, visual inspection of the data did not lead to definite conclusions on how the intervention effected positive and negative statistics. However, comparison of the means suggest the intervention affected the athletes differently. Athlete #2 (+1.7) and #4 (+.9) seemed to benefit from an increase in positive measures. Both of these athletes did not experience much of a negative decline (-.3 and -.1 respectively). Athlete #1 was the only participant that seemed to be affected by a

Table 3  
*Immediacy of Effect Total Mean Differential*

<table>
<thead>
<tr>
<th>Across All Four Athletes</th>
<th>Last 5 Games of Baseline/Pretreatment Mean Win Score (Win Score Sum/20)</th>
<th>First 5 Games of Intervention/Post-treatment Mean Win Score (Win Score Sum/20)</th>
<th>Total Mean Differential</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.97</td>
<td>6.42</td>
<td>+.45</td>
</tr>
</tbody>
</table>
Figure 2: Graphs of the positive (made FGs, ½ FT, total rebounds, steals, ½ assists, ½ blocks) and negative (missed FGs, ½ FT, turnovers, ½ fouls) statistics accumulated for each of the four athletes. Vertical line is when treatment was implemented.
decline in negative outcome measure (-.9). His gains were seen in the improvement of positive statistics (+1.2). Athlete #3 experienced the inverse of athlete #1 by showing a decline in positive statistics (-1.6) and a decrease in negative measurements (+1.1).

**Individual Comparison**

Assessing the impact of the intervention upon each individual athlete is of critical importance in single-subject, multiple baseline studies. Individual assessment is also important from a practical standpoint when working with elite athletes and explaining the results to coaches. The following section will review and analyze the data for each athlete individually.

Participant 1 competed in all 28 National Collegiate Athletic Association (NCAA) Division II opponent games (out of division opponents were not counted). His baseline consisted of the first nine NCAA Division II games of the season and the intervention comprised the final 19 NCAA Division II games. Athlete 1 had the largest Win Score average improvement with a 1.11 increase (figure 3).

![Figure 3](image)

*Figure 3 – Win Score performance for participant #1 over 28 games. Vertical line represents when the intervention was applied. Dotted lines represent the means.*
Athlete 1’s data suggests that the intervention did not help him immediately, but it did help over the long term. Athlete 1 exhibited a negative immediacy effect of -2.5 and his overall average improvement was 1.11. This trend would indicate that the longer the athlete continues the intervention, the better his performance. As it was with every participant, player improvement is not easily determined by visual inspection.

Athlete 1’s questionnaire was very positive. If the intervention was offered to him in the future he stated that he would use it again. He indicated that the target behaviors chosen for the self-review video were extremely important and that he was very motivated to improve those target behaviors. He felt as though the intervention was extremely effective and significant in increasing his ability to perform the target behaviors. He wrote that the self-review video helped him understand how to handle the situations he viewed on the video when he encountered them in a game.

Athlete 2 did not miss any games and had his intervention introduced after the 12th Division II opponent. The mean Win Score for participant #2 rose .82 between the pre-treatment and post-treatment phases (figure 4). His immediacy of effect was 1.9. This player’s immediacy of effect was the highest among all the participants. His high score was due to a particularly impressive game where he scored 40 points that included 10 three pointers.

On his exit questionnaire Participant #2 indicated that he was very motivated to improve the target behaviors. Also, he stated that the target behaviors chosen for the self-review video were very important in relation to successful performance. He felt as if his ability to perform the target behaviors increased. He wrote that the video “was almost like a constant reminder to do those target behaviors every chance I got on the court.” He
added, “It also reminded me that I can do those target behaviors very well.” He also made the remark that he felt that every target behavior got better as the season went on. This is especially interesting to note because the data seems to support this notion.

![Graph of Participant #2's Win Score over 28 games. The vertical line indicates when the intervention was applied. Dotted lines represent means.](image)

*Figure 4* - Win Score for Participant #2 over 28 games. Vertical line represents when the intervention was applied. Dotted lines represent means.

Athlete #2 thought a negative aspect to the study was that during long weeks without games the video got a little boring by Thursday. He commented that it got better after adding new highlights. In addition, he wrote that he would use this procedure if it were offered in the future and thought more athletes should use this sort of application.

Athlete #3 was the only athlete to miss a game versus a Division II opponent. Due to injury participant #3 missed a game against Fort Lewis on 12/18/09. He had a 15 game pre-intervention phase and a 12 game post-intervention phase.

Athlete #3 had the least amount of variability between his Win Score data points. Despite this, visual inspection does not yield definite conclusions. Athlete #3 displayed a .65 mean Win Score increase between the baseline and intervention phase (figure 5). He had a similar increase in immediacy of effect with a .6 improvement.
Figure 5 - Win Score for Participant #3 over 27 games. Vertical line represents when the intervention was applied. Dotted lines represent means.

On his exit questionnaire Athlete #3 indicated he was extremely motivated to improve the selected target behaviors. After he began the intervention he stated his motivation to better target behaviors sharply increased initially and leveled off for a while and then increased again for rivalry games and the playoffs. He reported that he believed the intervention was effective and that his targeted behaviors increased. He noted in particular that his free throw percentage increased after the intervention was introduced. Free throw shooting was an especially troubling skill for this athlete.

Athlete #4 naturally had the shortest intervention phase comprising of eight games (figure #6). The trend that formed between the participants was that the longer the participant’s intervention phase, the more of a positive effect it had on the mean Win Score. Athlete #4’s mean Win Score increased the least with a .38 improvement between the pre-treatment and post-treatment phases. The immediacy of effect for Athlete #4 was 1.8. The higher immediacy score than overall mean Win Score improvement went
against the trend of improving more as the intervention progressed. The high immediacy score was in part due to the final game in the baseline phase being one of his lowest scores all season (-3).

Figure 6 - Win Score for Participant #3 over 27 games. Vertical line represents when the intervention was applied. Dotted lines represent means.

Every participant in the study expressed their appreciation for the intervention process, but based on personal communication Athlete #4 seemed to enjoy it the most. Of all the participants he had the least amount of playing time and was motivated to increase it. He thought of the intervention as another way to improve his performance and to better his chance at staying on the floor for longer periods of time.

Despite Athlete #4 having the least increase in mean Win Score between baseline and intervention phase, his responses in the exit questionnaire were very encouraging. He reported being very motivated to improve the target behaviors displayed on the video and felt the as though the video was efficient in improving those behaviors. He liked the fact that the video did not take much time out of his day or normal preparation for a
game. He added that the video was a good reminder of the things he needed to do and that actually seeing the behaviors was better than talking about them. He also commented that, “Watching the video made me realize the things that looked good when I did them, so I wanted to do those things more often.” That comment is a good example of how a self-modeling video can create motivation for its user.

**Summary**

The data obtained in this study indicated that the intervention of imagery and positive self-review had a positive effect on the performance of four intercollegiate basketball players. There was improvement in the group perspective and the individual perspective. Though performance increase was not apparent through visual inspection alone, each athlete improved his average Win Score after taking part in the intervention. Exit questionnaires indicated that the athletes enjoyed the intervention and felt that it improved their overall performance.
CHAPTER V
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to examine the effects of imagery and positive self-review on game performance among four elite college basketball players. A single-subject, multiple baseline design was used to evaluate the effectiveness of the cognitive-behavioral intervention. The participants used an Apple iPod iTouch digital player to view their own positive self-review video three times a week on non-game days and twice on game days. The skills or “target behaviors” displayed within the positive self-reviews were representative of the dependent variable. At the conclusion of the last game of the season each athlete completed an exit questionnaire for social validity.

Evidence supporting the effectiveness of video modeling has been discussed (Dowrick, 1999). Social cognitive theory (Bandura, 1986, 1997) served as the theoretical foundation for this study. Modeling builds the image that is replayed in the mind prior to and after physical performance (Bandura, 1997). The self-modeling videos of the athletes’ own success was intended to provide the desired model and appropriate image (Halliwell, 1990). The literature on imagery and how it affects athletic performance was also examined (Driskell, Copper, & Moran, 1994; Feltz & Landers, 1994; Martin, Moritz, & Hall, 1999).
This study gathered data during actual competition rather than in a practice or laboratory setting (Kendall, Hrycaiko, Martin, & Kendall, 1990). Coaches are most interested in increasing the ability of their players to perform at the highest possible level in competitive or game situations. Therefore, it is believed that the most practical research information would come from collecting data from actual game or contest situations. This study was designed to evaluate performance in actual game settings. Utilizing four of the team’s top players (all starters), this study tried to determine if there was an advantage to using imagery and self-modeling videos as a source for mental practice.

Conclusions

It can be concluded that the imagery and self-modeling was successful in improving performance. A positive effect was seen in all four participants after the intervention was introduced. There is only a 6.25% (.5*.5*.5*.5) chance that all four athletes would randomly improve. Also, improvement was progressively greater the longer the athlete was exposed to the intervention. There was substantial variability found among the data points of the dependent variable. The multiple baseline design can help stabilize variability within and across phases by averaging the data points (Kazdin, 1982).

Single-subject design also allows for small but possibly consistent changes to be examined across individuals (Shambrook & Bull, 1996). It is important to note that every participant in the study improved his performance production. Across all four athletes there was a .74 increase in Win Score. By the time the last participant entered the intervention phase, the athletes participating in the study were, on average, out-producing
their previous group average by 2.96. In other words, on average between the four participants, they were accumulating some combination of Win Score statistics that equaled nearly 3. They may have scored an extra three points or blocked an extra shot and made an additional free throw and had one more steal and one less turnover, etc. Considering that on average collegiate teams score about one point per possession, the difference of nearly three in a Win Score average leads to an outcome difference of about three points a game. In practical terms, the intervention seems to have produced about an extra three points a game between the four participants. These are the kinds of results coaches are interested in when mental training techniques are used with their team.

It was decided that overall performance would be evaluated rather than a single outcome measure such as field goal percentage or a single behavior such as blocking out for rebounding (as other studies have done). The reason for this is that a single statistic, such as field goal percentage, explains only a small slice of performance and would show greater variability than a measure that accounts for multiple measures of performance. A behavior such as blocking out was not desired for practical reasons. Making the self-modeling videos and integrating them into a mental routine is very involved and time consuming. It was desired to investigate whether a mental training routine such as this could influence at a broader performance level. The time and effort needed to produce an intervention such as this does not seem sensible to influence one behavior.

It was the intention to customize the self-modeling videos to each individual and at the same time make sure that each athlete received the same treatment in the same manner. Player feedback from the exit questionnaire was overtly positive. Each
participant indicated that they enjoyed the intervention and increased their motivation to improve their “target behaviors”.

This study successfully incorporated the emergent technology of hand held digital media devices (Apple iPods) into mental training. To the researcher’s knowledge, this is the first study to use such devices. The devices are prevalent in contemporary culture. Implications for the use of such hand held digital devices for athletes of a variety of sports may be substantial. Players could use the devices in a similar fashion as the participants did in the current study. They could view video of their own positive behaviors away from the court or playing field to enhance target behaviors. Watching positive self-review videos on hand held devices can offer more than improvement of adaptive behavior. Negative thoughts about the upcoming performance are commonplace just prior to a game or match. Hand held devices allow for positive self-review to be seamlessly integrated into pregame routines to direct thoughts in a positive direction. Improvements on the implementation of the treatment were also suggested and these will be discussed in the next section.

**Recommendations**

This study examined the effect of imagery and self-modeling on collegiate basketball players. The dependent variable was measured during actual competition. Other studies have conducted research that successfully drew its results from college games (Jordet, 2005; Kendall et al., 1990; Malroy, 2000). The ultimate goal of applied sport psychology is to improve game performance. It is recommended that future researchers continue to gain results from game situations. Further studies with high
external validity such as these could help establish the effectiveness of various mental
training techniques in various contexts. Due to its practicality, results of these kinds of
studies may also further encourage coaches to allow sport psychology students or
professionals to use mental training techniques with their athletes.

Research has indicated that modeling may increase self-efficacy and/or
confidence which in turn could improve performance. This may partly explain the results
seen in the current study. Future studies in self-modeling may want to include
confidence and self-efficacy measures before and after the intervention takes place to
investigate a correlation between self-modeling, confidence, and performance.
Confidence changes could be measured through a personality inventory, questionnaires
or player logs.

Differences in imagery ability may have an impact on the effectiveness of the
intervention. When the athletes watched the self-modeling videos, they were instructed
to use imagery to put themselves in game situations. Variances in their ability to perform
this mental skill could have an effect on their ability to transfer their off-court mental
training to on-court performance. The inclusion of a questionnaire in imagery ability
may be useful for the selection of participants. Those with higher imagery abilities may
find the intervention more helpful and consequently would be more desirable as
participants.

An imagery ability measure could be also be used during the baseline phase and
compared to the intervention phase to help explain the effect of the intervention.
However, the extra demands of adding a mental routine to an already busy student
athlete’s schedule in itself can be difficult. Researchers should be cautious in asking too
much of an athlete. The athlete may become demotivated to take part in the study if required to take part in extra testing. The risk-reward aspect of additional testing should be considered by the researcher.

Research regarding modeling has shown that a model is effective if he or she is seen to have mastery over the desired skill and is similar to the observer. It would be interesting to see a study that blended footage of self-modeling and of professional athletes that have similarities to the amateur athlete. Watching a professional athlete execute skills in similar situations to what the amateur experiences may be exciting and motivating to the athlete. It would add instant credibility to the skills that are being suggested to replicate. Using professional athletes as models seems to be a natural progression to self-modeling alone. Observing and mimicking professional athletes is prevalent within the culture of collegiate athletes.

It would be ideal to not exclude teammates from the opportunity to partake in the mental training. It would be better to offer the intervention to those not selected for the study. The drawback of creating extra time-consuming videos is an obvious one. However, if there was a video coordinator on staff willing to help, it could be accomplished. It would be beneficial for everyone on the team to feel as though they have an equal opportunity to improve their performance. It would also be valuable to not send the message that players that get more playing time are more important and receive extra training benefits.
References


Appendix A

Informed Consent
INFORMED CONSENT STATEMENT

Western Washington University
Physical Education Health and Recreation Department

PRINT NAME: __________________________________________________________

I appreciate your willingness to involve yourself as a participant in this study. Please note that participation is entirely voluntary and that you are free to withdraw as a participant at any time during the course of the study. If you have any questions or comments during the course of the study please feel free to contact me at (360) 296-0349. The purpose of this study is to research whether an intervention program of imagery and self-modeling will improve basketball performance. This study will add to the existing body of literature on the effects of mental training on athletic performance. Risks involve only those associated with regular intercollegiate basketball competition. Any questions regarding your rights as a participant should be directed to: Geri Walker, WWU Human Protections Administrator (HPA), (360) 650-3220. In the unlikely event you suffer any research related injuries or adverse effects as a result of participation in the study the primary researcher and/or HPA should be contacted. The intent and potential benefit of the research is to increase your game performance statistics when you use the positive self modeling video.

As a participant, if you choose to participate, you will attend three sessions of approximately 30-45 minutes each session. I will be present at all the intervention sessions. I will answer any questions you may have concerning procedures. The intervention will be introduced at a randomly assigned time during the basketball season. The sessions will be on consecutive days between games. During the first session you will be given a brief introduction to the use of imagery and self-modeling to enhance performance. You will also view your personalized self-modeling video and be instructed on how to use it with imagery.

Day two will consist of a refresher on mental training concepts. Also, two trials on using imagery with the self-modeling video will be made. The last session will repeat the process of the previous day. In addition, instruction will be given on how to fill out the log book, how to use the hand-held digital media application, and when to use the intervention for home and away games.

If you choose to participate in this study you will be required to view the video at least once in the evening five times a week and twice on game days. This procedure will be followed for the remainder of the season. You will also be given a logbook to mark off the days as the imagery and self-modeling sessions are completed. After the final game of the season you will fill out an exit questionnaire based on your experiences of being involved in the study.

Results of the data collection will be analyzed visually through graphical presentation. The immediacy, trend, and replication of the treatment effect will be analyzed through this procedure. Data will be analyzed for presentation and/or publication. No reference will be made to specific individuals and all records are confidential. At the conclusion of the study results will be made available upon request.
Principal Investigator: Jon Rylaarsdam

I have read and do understand the procedures for the study described above. I am at least 18 years of age. I am aware of the potential risks and I agree to participate as a participant in the study described. I understand that I may withdraw from participation at any time during the course of the investigation without penalty. A copy of this consent form will be given to you.

Participant Signature: _________________________________ Date: __________
Appendix B

Positive Self-Review Video Procedure
Positive Self-Review Video Procedure

1. Capture game footage and mark clips
   a. To capture footage from a DVD you must take the footage from an analog source and it must be converted to a digital source. This is done by using a cannopus. RCA connections must be made from the DVD player to the “IN” connection on the cannopus. A firewire is then connected from the cannopus to the computer.
   b. In the Tapes section of Fastbreak, click on capture video and label it.
   c. Click “POWER” button
   d. Press play on the DVD player and when the DVD starts to play it will appear on the computer screen.
   e. Click “CAPTURE” button
   f. At the end of the DVD click “PAUSE”, then click “POWER” – wait for the green bars to move completely to the right.
   g. Click File-Eject

2. Marking (“marks” are made at the beginning and end of the desired video to cut the video into clips)
   a. Click TAPES-Library
   b. Double click the tape you want to edit
   c. Click “PLAY” button
   d. Mark the start of the play by pressing 1, this marks an “IN” and then mark the end of the play press 2 to mark the “OUT”.
   e. At end of tape, click “EJECT” button

3. Bring clips into Games section
   a. Click GAMES-Library
   b. Select the game by double clicking on it. The game will appear as whatever it is you labeled it earlier.
   c. Click Video-Attach Tape, which will bring up the Tape Library, and select the tape that you want to attach to the game.
   d. By using the data picker on the right, click offense or defense depending on whether the play is offensive or defensive.
   e. When finished, click “EJECT” button.

4. Working in the Projects section – This section is used to order and trim clips. It is also in this section where you “print to tape” which allows you to put your created “cutup” (collection of plays) onto a DVD.
   a. Open the PROJECT Library
   b. To make a new “cutup”
      i. Drag the desired clips from the left hand side to the right. (The clips will be labeled Offense and Defense according to how you labeled them in the Games section).
      ii. “Bookmark” the plays that you want to put into its own cutup by pressing b, h, j, k, or l. Each letter is represented by a different color. Basically, you can make up to 5 different cutups at a time.
iii. Once the desired clips are chosen, right-click the open space at the top of the bookmarks and choose “create new cutups”

iv. Name each color bookmark something descriptive

c. When finished making the cutup typically you want to “trim” each play to cut out extraneous action. Do this by pressing the t key on every play. A box with two screens will appear that show the beginning and end of the play (the “IN” and the “OUT”). This allows you to move the “IN” and “OUT” to where you would like it. Select the screen you would like to edit by clicking on it. Press the spacebar to start the play and you can press control+shift for slow motion and then the arrow keys to move the action and then spacebar again to stop it where you would like. An “IN” or an “OUT” will be made where you leave the screen.

5. Putting the “cutup” onto a DVD

a. The RCA connections must now be reversed on the DVD recorder by connecting them to the “In” input and then they need to be moved from the “IN” connections on the cannopus to the “OUT” connections.

b. When satisfied with the order of clip, trimming, and slides (if slides where made) click on the open space at the top of the “cutup” and select print-to-tape.

c. Click start

d. The video will start to play on a small screen on the right.

e. Press the Record button on the DVD recorder.

f. When finished, follow the steps to finalize the DVD on the DVD recorder.

6. Adding music

a. Instead of printing to tape, select print to file (this saves the cutup onto the laptop).

b. Open Windows Movie Maker and attach the video by selecting the “bring in video” option on the left (you need to open it from wherever you saved it).

c. You can add music by selecting the “bring in music” option and bring in any music that you have saved on your computer.

d. You have the option of cutting the music down, adding fade ins and outs if you like, or turning off the sound to the video, etc. You have the option to get creative at this point. You can also add title lead-ins and credits for the end of the video here.

e. When satisfied with your video click “Save to my computer”
Appendix C

Exit Questionnaire
Exit Questionnaire

Answer the following questions as honestly as you can. It is especially important to note negative aspects of the study.

1. In your opinion, to what extent were the target behaviors chosen for the self-review video important in relation to successful performance (Kendall et al. 1990)?

<table>
<thead>
<tr>
<th>No Importance</th>
<th>Little Importance</th>
<th>Somewhat Important</th>
<th>Very Important</th>
<th>Extremely Important</th>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

2. Describe your motivation to improve the selected target behaviors after the intervention was introduced.

<table>
<thead>
<tr>
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<th>Little Motivation</th>
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<th>Very Motivated</th>
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<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3. After you started using the video, did you notice a pattern in your motivation? (Please circle one) Yes / No. Please explain. For example, would you say your motivation slowly increased or decreased, did it increase sharply and then level off or decline, did it never change, etc.? ________________________________

   ________________________________

   ________________________________

4. Do you feel like your ability to perform the targeted behaviors increased? (Please circle one) Yes / No. If yes, what significance would you place on the changes?

<table>
<thead>
<tr>
<th>Little Significance</th>
<th>Somewhat Significant</th>
<th>Very Significant</th>
<th>Extremely Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
5. Could you please describe how the intervention affected your performance (positively and/or negatively)? __________________________________________
__________________________________________________________________
__________________________________________________________________

Please rate the overall effectiveness of the intervention for you and your performance.

<table>
<thead>
<tr>
<th>Not Effective</th>
<th>Little Effectiveness</th>
<th>Somewhat Effective</th>
<th>Very Effective</th>
<th>Extremely Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

6. Were the procedures used acceptable to you, especially considering possible alternative procedures that might be available to accomplish approximately the same results? Yes / No. If no, please explain. __________________________
__________________________________________________________________
__________________________________________________________________

7. Is there anything you would like to add about your experience in being a participant in this study? Yes / No. If yes, please explain. __________________________
__________________________________________________________________
__________________________________________________________________

8. Were there aspects of the study that you particularly did not enjoy or found to be negative in any way? Yes / No. If yes, please explain. __________________________
__________________________________________________________________
__________________________________________________________________

9. Please list any suggestions for improvements for future studies that may be similar to this one. __________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

If this intervention was offered to you in the future would you use it again? Yes / No

Adapted From: Hrycaiko & Martin (1996)
Appendix D

Audio Segment Scripts
Athlete #1

Target Behavior – Check for Offensive Rebounder

When a shot is taken and I am guarding a player on the perimeter it is important that I check to see if he is crashing. If he is going for the offensive rebound I will make contact and seal the defender. If he is not I am free to collect the rebound.

Target Behavior – Defensive Blocking Out

Defensive rebounding is incredibly important. If my man gets a rebound because I did not block out I am giving the opposition an extra possession. To rebound well I must create good contact once the shot is taken and then keep the player on my back.”

Target Behavior – Set Offense

As a point guard I love making my teammates better by getting them the ball in a position to score. For me it’s all about making the simple play. I use my court vision to see the openings and make the easy pass. When I am truly focused I can read my teammate and understand that we are on the same page. I can also anticipate where he is headed and know that he’ll follow through. Even though I am a pass first player I am just as willing to score when the opportunity presents itself. I can score when it is needed. Pay attention to the good arc on all my shots

Target Behavior – Fast Break

I am at my very best on the break. I want to push the ball down court on every play and take advantage of my greatest strengths which is my court vision and decision-making. Again, I want to push the ball as quickly as I can on every outlet pass so I can put myself in position to make plays as many times as possible.

Target Behavior – Free Throws

I love getting to the line because it is a good opportunity for easy points.
Athlete #2

Target Behavior – Set Offense

I am a versatile player that causes problems for the defense because I am a good passer and can score many ways. I am effective at scoring off the drive, hitting the pull up jumper, and shooting the three. I am also effective at posting up smaller guards. I also move well without the ball and look to put myself in a good position to score easy baskets.

Target Behavior – Offensive Rebounding

Making the extra effort on the offensive glass can be a game-changer. When a shot is taken and I am not responsible for having back, I crash the offensive boards. This extra effort can lead to extra possessions or easy put back lay-ins.

Target Behavior – Free Throws

I love getting to the line because it is a good opportunity for easy points.

Target Behavior – Defense

I believe that I am a better defensive player than what I get credit for. I will try to prove myself as good defensive player on every defensive possession. I want to stay in a good low stance so I can quickly move my feet and keep my man in front without reaching.

Target Behavior – Defensive rebounding

Defensive rebounding is incredibly important. If my man gets a rebound because I did not block out I am giving the opposition an extra possession. On average a team scores about one point per possession. When thinking about it in these terms I am giving the opposition an extra point each time my man grabs an offensive rebound.

Target Behavior – Check for Offensive Rebounder

When a shot is taken and I am guarding a player on the perimeter it is important that I check to see if he is crashing. If he is not crashing I am free to chase down the rebound. If he is going for the offensive rebound I will make good contact when the shot is taken and keep my man on my back.

Target Behavior – Fast Break

As soon as the defensive rebound is secure I want to take advantage of my quickness and speed and get out on the break as early as possible. I am confident that if I get myself open I will have several opportunities to make good decisions that lead to easy points.
Athlete #3

Target Behavior – Defense (Not Fouling)

Defense is all about desire. I want to stay in a good defensive stance to keep myself engaged and to quicken my reactions. I want to stay active while staying under control on every defensive possession. Concentrate on using both arms when I play defense. Don’t worry about the whistle and play smart and active defense.

Target Behavior – Defensive Rebounding

Being an interior defender it is especially crucial for me to find an opposing player to block out. Defensive rebounding is incredibly important. If my man gets a rebound because I did not block out I am giving the opposition an extra possession.

Target Behavior – Offensive Rebounding

I can get the ball in the paint one of two ways: either by posting early and strong when I get the chance or by grabbing the offensive rebound. Going hard for the offensive rebounds is a great way to increase my touches in the paint

Target Behavior – Fast Break

As soon as I know the rebound is secure I want to get out on the break as soon as possible to take advantage of my superior speed and good finishing skills. If I hustle and sprint on every defensive rebound I will improve my scoring opportunities.

Target Behavior – Set Plays

I always want to set good screens to create openings for myself and my teammates. In the set offense I primarily play in the post. I want to post early and often. When I catch in the post I either make a quick move without dribbling or I check the defense for a double and then use my dribble to get closer to the basket. If the defense does come with a double I give a quick pass to the open man. In other situations when I am not playing in the post, I want to look for an opening to drive straight towards the hoop or give a good pass.

Target Behavior – Free Throws

In my relaxed motion my shoulders feel loose and my follow through is smooth. If I shoot my regular shot with deep focus and with a relaxed motion I will be satisfied with my attempt regardless of whether or not I make it.
Athlete #4

Target Behavior – High Post

From the high post area I am primarily looking to make a good pass or take a shot if the defender plays off.

Target Behavior – Working for low post position

It is to my advantage to catch it inside. I want to stay low to create a stronger base when I make contact with the defender. The harder I work for position the easier it will be to score after the catch. If the defender is playing on my high side I want to push him up the lane, if he is playing behind or on the low side and want to keep my feet moving and push him back or lower. When I do get it, I want to look to score more often. I also want to look for openings for a duck in.

Target Behavior – Catch Deep

If I catch it deep I do not waste time making a move. I will shoot a hook with either hand after taking no more than one dribble.

Target Behavior – Finishing Strong

Any time there is an opening to dunk it I want to take it. Otherwise, when finishing I want to fully extend and shoot high off the board. If I need to create space I can crab dribble while making good contact and then finish, or I can give a quick up-fake to get my man in the air.

Target Behavior – Offensive Rebounding

I can get the ball in the paint one of two ways: either by posting early and strong when I get the chance or by grabbing the offensive rebound. Going hard for the offensive rebounds is a great way to increase my touches in the paint.

Target Behavior – Defense (No Fouling)

I want to stay between my man and the basket and stay down on pump fakes. I must focus on my lateral movement and staying patient. I want my man to shoot over my extended hand for every shot.

Defensive Rebounding –

When the shot goes up I am very consistent at finding a body to block out. As I block out I want to get my hands up and in a ready position to go get it.
Appendix E

Log Book Sheet
Log Book Sheet

<table>
<thead>
<tr>
<th>Week #</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Session Date</td>
<td>Session Date</td>
<td>Session Date</td>
<td>Session Date</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>Time</td>
<td>Time</td>
<td>Time</td>
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<tr>
<td></td>
<td>Initial</td>
<td>Initial</td>
<td>Initial</td>
<td>Initial</td>
</tr>
</tbody>
</table>

| 2      | Session Date | Session Date | Session Date | Session Date |
|        | Time         | Time         | Time         | Time         |
|        | Initial      | Initial      | Initial      | Initial      |

Game Day Checklist

Post-Intervention Game 1 ____________

Session Completed After Shootaround _____
Session Completed Within Hour of Tip Off _____
Initial _____

Game 2 ____________

Session Completed After Shootaround _____
Session Completed Within Hour of Tip Off _____
Initial _____