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TRAINING NOVICE ATHLETES TO SELF-REGULATE DURING MOTORIC PRACTICE

by

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Abstract

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Adviser: Professor Barry Zimmerman

The additive effects of self-regulation training in forethought, performance control, and self-reflection phase processes on novel motoric skills and motivation were studied with 50 college aged students. The participants were selected based on multiple criteria to help ensure that they were novice free-throw shooters. They were randomly assigned to one of five groups: a) three phase group, b) two phase group, c) one phase group, d) practice control group, and e) no practice control group. All groups received identical shooting instructions and were allowed to practice their free-throws during a 12 minute practice session (i.e., except for the no practice control group). It was hypothesized that individuals who received training in all three phases of self-regulation would outperform the two phase group which would outperform one phase group, which in turn would outperform both control groups in shooting performance and in perceptions of self-efficacy, intrinsic interest, satisfaction, and performance standards. It was also predicted that the self-regulation training groups would make more technique attributions and technique strategic adjustments than the control groups and would evaluate their performance based on process/self criteria rather than on outcomes. In general, the results showed that the participants who were trained to engage in the complete self-regulatory feedback loop (i.e., all three phases) during the practice session displayed the highest shooting skill and most adaptive motivational profile. The motivational profile consisted of making technique attributions, technique strategic adjustments and using process/self criteria to evaluate their performance. Technique attributions and technique strategic adjustments were highly correlated with each other as well as with shooting performance variables. The two phase group showed comparable shooting skill to the three phase group and made adaptive attributions and strategic adjustments, but evaluated their performance using outcome or normative criteria. The one phase group obtained shooting skill scores comparable to the control groups and displayed a maladaptive motivational orientation. Unexpectedly, no group differences emerged for self-efficacy, intrinsic interest, satisfaction, and performance standards. However, consistent with prior research, self-efficacy was predictive of various self-regulation processes including intrinsic interest, satisfaction, and performance standards.

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CHAPTER ONE
INTRODUCTION

Athletic performance has been studied extensively over the past few decades. Although several areas have been investigated, a major focus has been to identify the factors that differentiate between individuals who become highly skilled in a sport and those who do not. Originally, it was believed that expert performance was the result of superior physiological abilities of an athlete including visual perceptual ability (e.g., visual acuity, stereopsis, ocular movement) and psychomotor skills (e.g., reaction time or movement time) (Garland & Barry, 1990; Starkes & Deakin, 1984). These abilities are assumed to be general traits or talents that can influence an individual's performance in many areas but are typically unaffected by training or practice. However, Garland and Barry (1990) and Starkes (1987) have concluded that there is little empirical evidence that innate talent relates to the development of sport expertise. Similarly, Ericsson and Charness (1994) concluded, "the traditional view of talent which concludes that successful individuals have special innate and basic capabilities is not consistent with the reviewed evidence" (p. 744).

There is increasing evidence that differences between skilled athletes and less accomplished performers can be attributed to cognitive and behavioral factors (Ericsson & Charness, 1994; McPherson & Thomas, 1989; Paull & Glencross, 1997; Williams & Davids, 1995). For example, experts have been shown to have superior knowledge (Thomas & Thomas, 1994) and more accurate and rapid decision-making skills during sport activities than novices (McPherson, 1993; Starkes; 1987). In addition, experts appear to have superior skills in anticipating opponents' movements and in predicting shot placement in field hockey (Starkes, 1987), tennis (Jones & Miles, 1978), ice hockey (Bard & Fleury, 1981), and soccer (Williams & Davids, 1995). These abilities appear to be a function of the players' efficient use of and processing of relevant and meaningful visual cues.

Although these findings highlight the importance of cognitive skills in expert performance, they do not explain how athletes develop into highly skilled performers. A growing body of research shows that athletes become highly skilled by engaging in highly structured and organized practice sessions (Cleary & Zimmerman, 2000; Ericsson, Krampe, & Tesch-Romer, 1993; Hodges & Starkes, 1996). These practice sessions typically incorporate self-regulatory processes such as goal-setting, self-monitoring, and evaluating performance feedback. However, this is not to say that certain genetic or physical characteristics do not facilitate the athletic achievement of individuals participating in sports (e.g., height in basketball). Rather, it is the systematic and deliberate attempt to master critical form processes during practice sessions that appears to separate the expert and novice athlete (Cleary & Zimmerman, 2000). A variety of deliberate practice and self-regulatory models have been developed to explain how athletes can most effectively practice their sport-specific skills.

Models of Deliberate Practice/Self-Regulation

Ericsson et al. (1993) developed a theory of deliberate practice to help explain why and how novices become expert performers. They define deliberate practice as individualized training on tasks that are selected and structured by knowledgeable teachers in order to provide "optimal opportunities for learning and skill acquisition" (Ericsson & Charness, 1994, p.739). This definition suggests that athletes who have their coaches structure their practice sessions, provide feedback about performance, and guide their mastery attempts will have a greater chance of becoming sport experts. The essential features of deliberate practice are as follows: a) setting goals involving specific skills, b) being intensely involved in structured training sessions c) performing tasks that are not inherently motivating and contain few external rewards, and d) self-monitoring performance outcomes and receiving feedback about current performance (Ericsson et al., 1993). In essence, these features of deliberate practice appear to reflect teachers' or coaches' systematic attempts to instill self-regulation in their pupils (Zimmerman, 1999). Like athletes who are instructed to practice deliberately, self-regulated learners structure their practice sessions by setting specific goals, self-monitoring performance outcomes, and evaluating performance feedback.

Although this model of deliberate practice is useful when attempting to explain how novice athletes develop into experts, it has some limitations. First, the model assumes that these practice sessions are primarily structured by highly competent coaches. As a result, the model minimizes the importance of the athletes' role in developing and structuring their practice sessions and thus does not explain how and why individuals engage in deliberate practice. More specifically, it does not describe the different processes that often underlie an athlete's initial and sustained motivation when practicing sport-specific skills (e.g., self-efficacy, outcome expectations). Ericsson et al.'s model also does not explain how athletes' self-reflections (e.g., self-reactions, self-judgments) about their performance during practice sessions influence their goals and strategic planning during future practices. Self-regulation models address these limitations by providing a more detailed description of these motivational and behavioral processes and by assuming that athletes are much more proactive in structuring their practice sessions.

Currently, several models of self-regulation attempt to explain how individuals can practice their sport skills in order to attain optimal performance (Kirschenbaum, 1984; Singer, 1988; Zimmerman, 1989). Kirschenbaum's model views self-regulation as a sequence of five activities or phases a) problem identification b) commitment c) execution d) environmental management and e) generalization. Kirschenbaum's model hypothesizes that these processes operate in a feedback loop, communicating to the athletes whether they should maintain, improve, or change existing behavioral patterns. Unfortunately, there has been only a minimal attempt to empirically validate the sequential nature of this model.

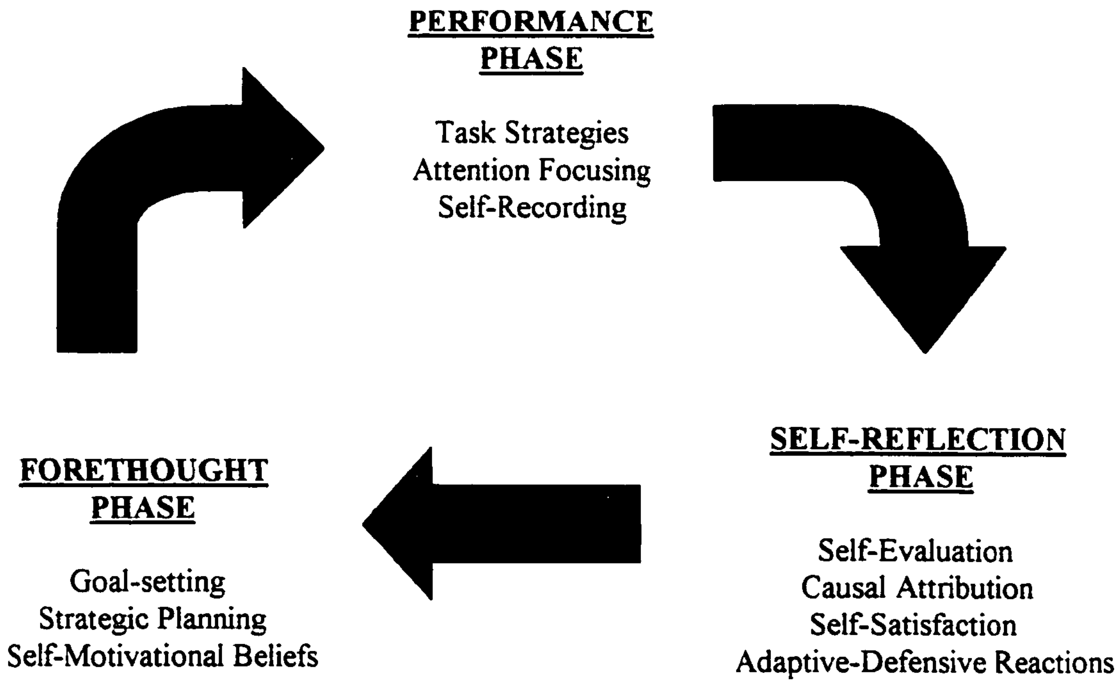
Another five step model of self-regulation was developed by Singer and Cauraugh (1985). This model applies to athletes of all skill levels and consists of the following five sequential steps: a) getting ready by engaging in a pre-activity ritual or relaxing, b) imagining oneself performing the specific motor skills flawlessly, c) focusing on a specific object in order to eliminate distracting thoughts, d) executing the act without thinking about the behavior or its possible outcomes, and e) if time permits, evaluating the performance outcomes and effectiveness of each step in the routine and make necessary adjustment. The primary drawback to this model is that it encourages the athlete to avoid self-monitoring their thoughts and behaviors during the execution of a motor skill because thinking is hypothesized to decrease performance levels. For example, Singer and colleagues would argue that basketball players should focus on the back of the rim or some other point of focus when shooting rather than thinking about getting the proper release point or follow through. Although Singer and colleagues have provided some empirical support for the validity of their model (Singer, 1988; Singer, Flora, & Abourezk, 1989), social cognitive researchers have shown that novice athletes who monitored motoric processes as they practiced, achieved a higher level of success, had higher perceptions of self-efficacy and satisfaction than those athletes who did not self-monitor (Kitsantas & Zimmerman, 1998; Zimmerman, 1989; Zimmerman & Kitsantas, 1997).

According to Zimmerman's model, developed from social cognitive and academic research, self-regulation refers to self-generated thoughts, feelings, and behaviors that are planned and cyclically adapted based on performance feedback in order to attain self-set goals (Zimmerman, 1989). This model is predicated on several assumptions. First, it is assumed that there are several influences on students' self-regulated learning including personal, behavioral and environmental processes. Thus, self-regulated learning is not determined only by personal processes (i.e., goals, beliefs, knowledge), but rather also by environmental and behavioral processes. The model also assumes that these three influences are interdependent and thus have reciprocal influences over each other (Zimmerman, 1989). The self-regulated learner will attempt to strategically exert control over each of the three types of influences in order to accomplish a self-set goal.

The key personal influence, self-efficacy, is defined as personal judgments of one's capabilities to organize and execute courses of action to attain designated levels of performance (Bandura, 1977). This construct is a crucial aspect of the model because it has an influence over other major self-regulatory processes such as self-monitoring and use of learning strategies. Other personal influences include knowledge, metacognition, goals, and affect (Zimmerman, 1989). There are three categories of behavioral influences on self-regulation; self-observation, self-judgement, and self-reaction. In general these are types of student responses that impact future behaviors and cognitions. Self-observation is a general term that involves systematically monitoring one's own performance (Zimmerman, 1989). Self-judgment is defined as evaluating one's own performance and assigning causal influence to the results (Zimmerman, 1999). Finally, self-reactions refers to judgements about how to alter self-regulatory strategies as well as satisfaction with one's performances (Zimmerman, 1999). Self-regulated individuals will deliberately and systematically use, modify, and adjust their behaviors (e.g., strategy use) during subsequent learning attempts. The third category involves environmental influences including modeling, verbal persuasion, and enactive experiences (Zimmerman, 1989). Self-regulated learners will learn effective strategies from models and will pro-actively adust or modify their learning environment in order to optimize their learning efforts.

Another key assumption of this model, and the primary focus of the current study, is the cyclical nature of self-regulation. It is cyclical in that feedback from previous performances is used to make adjustments during current and future efforts (Zimmerman, 1999). From a social cognitive perspective, the different self-regulatory processes within the personal, behavioral and environmental categories are structurally related and also cyclically sustained (Zimmerman, 1999). This model hypothesizes that a complete self-regulatory feedback loop involves three general phases: forethought (i.e., processes which precede any effort to act), performance control (i.e., processes occurring during motoric effort), self-reflection (i.e., processes occurring after performance). It is hypothesized that forethought processes (e.g., self-motivational beliefs, goal setting, strategic planning) will influence performance control (e.g., self-observation, self-control) which will in turn influence self-reflection processes (e.g., self-evaluations, attributions, satisfaction). Finally, to finish the complete cycle, the self-reflection processes will influence forethought processes to further performance efforts. It is also important to note that the processes within each phases are hypothesized to be highly correlated with one another (Zimmerman, 1999). Figure 1 depicts the cyclical phases and subprocesses of self-regulation.

Figure 1. Cyclical Phases and Subprocesses of Self-Regulation



Forethought processes will set the stage for action and include goal setting, strategic planning, and underlying self-motivational beliefs (i.e., self-efficacy, intrinsic interest). Goal setting has been defined as deciding on specific outcomes of learning or performance (Locke & Latham, 1985). In general, specific, short-term, and moderately difficult goals will increase efforts to act more than general, long-term, and easy goals (Locke & Latham, 1985). In addition, social cognitive researchers have emphasized the distinction between process and product goals, highlighting the importance of establishing process goals when attempting to initially learn a motoric skill (Zimmerman & Kitsantas, 1996). Another forethought process is strategic planning which involves purposively selecting a strategy to optimize one's performance during practice efforts. Self-regulative strategies are purposive personal processes and actions directed at acquiring or displaying skills (Zimmerman, 1989). According to social cognitive theory, strategies are situationally specific in that a strategy may work for an individual in one situation but not in another setting.

Underlying forethought processes of goal setting and strategic planning are a variety of self-motivational beliefs including self-efficacy, intrinsic interest, and outcome expectations. Self- efficacy is the key motivational process and is defined as a person's beliefs about performing actions at a specific standard of performance (Bandura, 1986). Perceptions of self-efficacy are important because they are hypothesized to influence three dimensions of an individual's motivation; choice of activities, effort, and persistence (Zimmerman & Bonner, 1996). They also have been shown to be related to sport expertise (Cleary & Zimmerman, 2000).

The performance control phase of the model includes two major processes: self-control and self-observation (Zimmerman, 1999). Self-control processes include self-instruction, imagery, attention focusing, and task strategies. These processes helps to guide a student or athlete as they are learning or performing a skill. Self-observation is another performance control process and has been defined as students' responses that involve systematically monitoring their own performance (Zimmerman, 1989). This is a key self-regulatory process because it can provide information about whether one is achieving his or her goals. A common self-observational technique is self-recording which typically involves writing down the processes and outcomes of their actions. Research in motoric activity has shown self-recording to be an important technique in improving the self-efficacy and achievement of novice dart throwers (Zimmerman & Kitsantas, 1996, 1997).

The third phase of this cyclical feedback model involves two self-reflective processes that are intimately linked to self-observation: self-judgment and self-reactions (Zimmerman, 1999). Self-judgment involves systematically comparing one's performance with specific mastery criteria, with earlier levels of one's behavior, or against the performance of others. The related sub-process, causal attributions, refers to a person's perceived causes of the outcomes of some behavior or event (Weiner, 1972). The attribution that a person makes following success or failure is an important influence on one's motivation, ability to adjust or modify faulty or ineffective strategies and goals. Zimmerman and Kitsantas (1996, 1997) showed that when novice dart throwers attributed inadequate performance to errors in learning strategies, their motivation to persist on the task was sustained.

Finally, another self-reflection category, self-reactions, refers to two processes that occur after a person evaluates his or her performance and makes an attribution about that performance: self-satisfaction and adaptive/defensive inferences (Zimmerman, 1999). Self-satisfaction refers to perception of satisfaction or dissatisfaction regarding one's performance. Adaptive or defensive inferences are conclusions involving how one needs to adjust his or her behaviors or actions during future learning attempts. Adaptive inferences encourage individuals to use new strategies or techniques that will improve their learning or performance (Zimmerman, 1999). In contrast, defensive inferences limit a person's ability to adjust to more appropriate strategies and thus limits a person's ability to improve inadequate performances. In essence, these reactions are important self-regulatory processes because they "affect forethought processes cyclically and often dramatically impact future courses of action toward one's most important goals and away from one's deepest fears" (Zimmerman, 1999).

Rationale

To date, several researchers have assessed the influence of self-regulatory processes within Zimmerman's Dynamic Feedback Model of Self-Regulated Learning on the development of motor skills in novice athletes. For example, Zimmerman and colleagues have conducted a series of experimental studies to examine the relationship between forethought processes (e.g., goal-setting, self-efficacy) and self-monitoring and dart skill in novice athletes. All studies assessed adolescent girls during dart-throwing practice sessions. One major finding from this line of research is the importance of forethought processes (e.g., setting process goals) when first attempting to learn a motoric skill. For example, Zimmerman & Kitsantas (1996) showed that girls who set process goals (i.e., to concentrate on executing all of the steps of the dart-throwing strategy) displayed greater dart-skill, higher levels of self-efficacy, satisfaction, and intrinsic interest than girls who set outcome goals. These studies have also shown the positive motivational and achievement effects of shifting from process goals to outcome goals after a certain level of automaticity has been achieved (Zimmerman & Kitsantas, 1997). Those girls who shifted their goals from executing the correct dart-throwing technique to hitting the bulls-eye, displayed higher levels of achievement than girls who set only process goals, outcomes goals, or no goals.

Researchers have also found that performance control processes (e.g., self-recording) have a significant impact on dart-throwers' motivation and motoric learning (Zimmerman & Kitsantas, 1997; Kitsantas & Zimmerman, 1998). More specifically, girls who were taught to self-record how well they executed dart-throwing steps, displayed higher levels of dart skill, self-efficacy, and satisfaction than individuals who were not taught to self-record. Taken together, these findings suggest that the self-regulation processes within first two phases of Zimmerman's Dynamic Feedback Model are important to consider when training athletes how to practice sport-specific skills. A more detailed analysis of the research in support of this model will be provided in the literature review section of this manuscript.

Social cognitive researchers have also realized the importance of examining the additive effects of training novice athletes to use multiple self-regulatory processes when practicing motoric skills. For example, Zimmerman and colleagues have assessed the additive effects of combining goal-setting with self-recording procedures on the dart throwers' motivation and achievement. Although some studies have found no additive effects of self-recording to that of goal-setting (Zimmerman & Kitsantas, 1996), other studies have shown that "self-recording additively enhanced the effects of all forms of goal setting on dart-skill attainment, self-efficacy beliefs, and self-reactions" (Zimmerman & Kitsantas, 1997, p.34).

Even though these studies have begun to shed light on important training methods for novice athletes, they are limited in several respects. First, these studies only assessed high school aged subjects. Thus, at this time it is unclear whether the results from this research generalize to other age groups. Similarly, this line of research on motoric learning is based solely on the skill of dart-throwing which was a novel task to these subjects. It is important to assess whether self-regulation training can facilitate the learning of other more familiar motor skills, such as shooting free-throws in basketball. Third, there is conflicting evidence about the additive effects of goal-setting and self-recording on novice athletes' achievement and motivation. Finally and most importantly, no study to date has examined the additive effects of training novice athletes to cyclically use forethought, performance control, and self-reflection phase processes when practicing athletic skills.

This study addressed these limitations by studying collegiate females during a basketball free-throw task. The subjects were asked to practice their free-throws in the gymnasium of the college that they attend. The experimental groups received instruction on self-regulation techniques, with the groups varying in the number of phases included in the instruction. In essence, the study determined whether training athletes to use self-regulation strategies in a cyclical fashion fostered higher levels of motivation and achievement than individuals who only received instruction in selected self-regulatory processes or no self-regulatory instruction.

CHAPTER TWO
LITERATURE REVIEW

The purpose of this chapter is fourfold: 1) to review research methodologies that have been used to assess athletic performance and achievement, highlighting the advantages of the process-oriented micro-analytic design, 2) to review studies assessing expert-novice athletes in order to identify the processes which reliably differentiate them, 3) to review and critically analyze research on selected self-regulatory sub-processes within the forethought (e.g., strategy use, goal setting), performance control (e.g., self-monitoring), and self-reflection (e.g., self-reactions, attributions) phases of Zimmerman's Dynamic Feedback Model of Self-Regulated Learning that are hypothesized to be related to motoric learning and 4) to discuss the significance of self-efficacy theory as it relates to improving motoric skills. In essence, each section will provide a rationale for a different aspect of the proposed dissertation including theoretical perspective, methodology and design.

Research Methodologies in Athletics

A variety of research designs and methodologies have been used to assess expert and novice athletes. In general these designs can be divided into two categories: outcome-oriented and process-oriented designs. This section will review these different methodologies and will attempt to highlight and emphasize the importance and value of using a micro-analytic approach when studying the motor skills of novice athletes.

Outcome Studies

Within the expert/novice paradigm, the majority of researchers have adhered to a basic methodological framework: a) identify the experts and novices within a particular sport, b) ask both groups to perform a task or multiple tasks, c) compare their outcomes on these tasks. Thus, researchers label individuals as being experts or novices, give each group the same task to perform, and then compare the group's performance. However, the nature of the tasks that the athletes have been asked to perform has varied. One of the most frequently used protocols in the sport expert literature is the recall task. The purpose of this task is to assess an individual's ability to recall game-structured (e.g., an actual play during a game) and unstructured scenarios (e.g., random players on a field). In general, this task consists of three major steps; 1) deciding on the medium to present the game-structured or unstructured information, 2) presenting the sport scenarios for a specified time limit, 3) assessing the player's recall of the different game situations. Another assessment protocol is the signal detection/recognition task. This task is similar to the recall protocol in that researchers present structured and unstructured game scenarios for a specified time interval. However, the key variable in this type of task is the presence or absence of a ball in the slides. The players are asked to indicate, as quickly as possible, whether the ball is present or absent. The accuracy and speed of their responses are usually the dependent measures.

Researchers have also used prediction protocols, which include visual-occlusion and anticipation tasks. Visual-occlusion tasks consist of presenting a video or static clips of a sport scene. The athletes are then required to predict the location of a shot or pass after a key part of the picture is blacked out (Starkes, 1987). The scene is typically occluded a fraction of a second prior to the execution of the shot or pass. The anticipation protocol is very similar in that the players are presented with a series of video clips and then asked to predict the location of the shot or pass (Williams & Davids, 1995). However, in this protocol the scenes are not blacked out. Rather, the subjects are required to state as quickly as possible where a particular person on the screen will pass as soon as the person touches the ball.

Although the specific procedures of these designs differ, they do share several similar features. First, they were developed to assess expert-novice differences in sports. In addition, almost all of the designs have evolved over the years to become more ecologically valid. For example, many of the earlier prediction studies (e.g., Allard & Starkes, 1980; Starkes, 1987) used static slide presentations of the various sport scenes. However, researchers began to argue that these slides were not appropriate because they did not adequately represent a meaningful sport situation (Williams & Davids, 1995; Williams, Les Burwitz, & Williams, 1993). Thus, it was difficult to generalize any findings from these studies to real-life athletic situations. As a result, researchers have started to develop more meaningful tasks such as using video film clips of real games or asking players to think aloud as they performed athletic skills. Finally, and most important, these tasks assessed performance outcomes rather than learning processes. For example, researchers using the recall task assessed the athlete's knowledge and memory skills while researchers using the visual-occlusion task analyzed the speed and accuracy at which players can predict performance outcomes. The researchers would then attempt to draw inferences about the unobserved learning processes. Thus, a major limitation of these outcome studies is that they did not directly assess the learning processes involved in students' acquisition of skill. This is a critical shortcoming to instructors seeking insight into how to best teach athletic skills to athletes.

Process-studies

Recently, there has been greater attention devoted to studying the processes that may facilitate the skill development of athletes. McPherson (1993) utilized a think-aloud protocol to examine how baseball players of different abilities plan and think prior to facing a pitcher. She showed videotapes of four batters during a real collegiate game to both expert and non-expert players. The video showed the pitcher, batter, and catcher from the viewpoint of the center-fielder looking in to the pitcher's mound. The subjects were instructed to imagine that they were the fourth batter and were preparing to face the pitcher on the videotape. The researchers asked the participants to verbalize what they were thinking about and doing as they prepared to take their turn at bat. This type of research design is more process-oriented and allowed the researchers to gather important information about the player's strategic and self-regulatory cognitions and behaviors.

Ericsson and colleagues have also hypothesized that assessing player processes (e.g., goal-setting, planning, self-monitoring) is an important way to assess how athletes develop into skilled performers. To date, only a few studies have tested Ericsson's deliberate practice model. Researchers who have conducted such studies have asked the players to retrospectively reveal information about how they practice their sport skills. For example, Hodges and Starkes (1996) asked expert and non-expert wrestlers to provide practice time estimates retrospectively as well as to rate different activities according to their relevance in improving their skills and enjoyment level. In general, the authors were interested in examining whether the highly skilled wrestlers focus more on the process of improving their wrestling techniques during practice sessions than less-skilled athletes. This emphasis on examining the learning processes of athletes during practice sessions is consistent with motor skills research conducted within the context of self-regulation models (Zimmerman, 1989).

Social cognitive researchers have developed a process-oriented methodology to train and assess the development of motor skills in novice athletes (Kitsantas & Zimmerman, 1998; Kitsantas, Zimmerman, & Cleary, 2000; Zimmerman & Kitsantas, 1996, 1997). In the majority of these studies, novice dart-throwers were randomly assigned to either a self-regulation training condition or a control group. All subjects viewed a model perform a multi-step dart-throwing strategy and then were given the opportunity to practice this strategy on their own. Subjects assigned to self-regulation training groups were taught how to set process goals, self-monitor performance outcomes, and/or evaluate performance feedback. Following this practice session, all subjects were post-tested on measures of self-efficacy, intrinsic interest, satisfaction, attributions, and dart-throwing accuracy. This is an important design because it allowed the researchers to train subjects to use self-regulation processes during motoric learning and then assess the effects of this training during practice. The advantage of this design is that it directly analyzes processes hypothesized to influence the development of motor skills. In addition, the design is more ecologically valid than most others because it assessed player's thoughts and behaviors while practicing motor skills on a relevant task. However, this design provided only limited assessment of the players' cognitions and behaviors throughout the practice session (i.e., only self-recording) and did not attempt to assess changes in other self-regulatory processes as their performance varied.

Cleary and Zimmerman (2000) is one of the few on-line studies to assess the full array of self-regulation processes of athletes as they practiced a sport-specific skill. In this research, expert and novice basketball players were first pre-tested on measures of self-efficacy, intrinsic interest and goal setting. The players were then given the opportunity to practice their free-throws until they made and missed a certain number of shots. During this practice session, the examiner asked the players to rate their self-efficacy, attributions, and self-reactions following two consecutive missed and made free-throw attempts. This variation in the typical social cognitive research design allowed the researchers to assess the players' initial beliefs and attitudes as well as changes in their perceptions as they practiced their free-throws. This design is not only on-line in its time perspective but also micro-analytic in its scope because it assessed specific mental and behavioral processes as they occurred and changed. Such a design can provide detailed information about the thoughts underlying a player's goal setting, a player's motivation to initiate and persist at tasks following failure, or a player's capability to self-correct mistakes or make adjustments when they are not performing well during self-directed practice sessions. More importantly, these studies yield information that can be used to develop athletic training programs for novice athletes. For these reasons, the current study utilized an on-line micro-analytic design when assessing novice basketball players.

Expert-Novice Differences

Much of the expert-novice research in the 1970's and 1980's was devoted to analyzing how visual-perceptual factors (e.g., dynamic visual acuity, depth perception) influence sport expertise. As indicated in the introduction, although these physical variables are deemed critical to sport performance, there is little empirical evidence to suggest that they are related to the development of sport expertise (Garland & Barry, 1990; Starkes, 1987). For example, Starkes (1987) conducted a study that attempted to differentiate international level field hockey players (i.e., experts), varsity field hockey players, and physical education students (i.e., novices) based on physiological abilities (e.g., reaction time, dynamic visual acuity, and coincident anticipation timing) and cognitive skills (i.e., recall of task-specific information, use of visual cues to predict shot placement, and decision speed and accuracy). This study was unique in that it utilized a multi-task approach (e.g., visual information task, recall task, shot prediction, tasks assessing simple and complex decision accuracy and speed). In general, the results showed that the physiological variables were unable to differentiate the three groups of field hockey players. All three groups had similar reaction times and dynamic visual acuity (i.e., ability to detect a detail on an object when there is movement between the object and person). However, with regard to the cognitive variables, experts showed better recall for game-structured information, predicted shot placement more accurately, and made more accurate decisions than novices (Starkes, 1987). In essence, although athletes need to have adequate physiological skills (e.g., static acuity, depth perception, range of perceptual visual field), their presence does not predict whether an individual will develop into an expert performer.

The sport expert literature has shown that experts and novices differ across several variables. For example, experts typically have more sophisticated knowledge, have better sport-specific memory skills, make more accurate decisions when performing sport-relevant tasks, and make more efficient use of visual cues to aid performance than novices.

The following section will highlight some of these differences and will focus on current research analyzing the self-regulation processes within experts and novice athletes.

Knowledge Differences

The expert literature has shown that "differences between experts and less accomplished performers reflect acquired knowledge and skills" (Ericsson & Charness, 1994). There is growing empirical support to suggest that experts have a more sophisticated and elaborate task-specific knowledge base than novices (Williams & Davids, 1995). The knowledge bases of athletes in various sports have been directly assessed by self-report questionnaires (French & Thomas, 1987; McPherson & Thomas, 1989) and think-aloud protocols (McPherson, 1993).

Experts' superior knowledge structures have also been indirectly measured in studies utilizing recall and recognition tasks. The key finding has been that the expert athlete's memory ability is better than that of novices only for meaningful, sport-specific information (Allard & Burnett, 1985; Starkes, 1987; Starkes, J., Allard, F., Lindley, S., & O'Reilly, 1994; Williams et al., 1995). When asked to remember random information or other information not related to their sport of expertise, there is no difference between experts and novices. Researchers have attributed this memory advantage as reflecting "a more efficient organization of task-specific information in memory" (Williams et al., 1993, p. 581).

Use of Sport-Specific Visual Cues

Experts have also been found to display superior ability to anticipate an opponent's movements and to predict shot placements in field hockey (Starkes, 1987), tennis (Jones & Miles, 1978) ice hockey (Bard & Fleury, 1981), and soccer (Williams & Davids, 1995).

These abilities appear to be a function of the player's efficient use and processing of relevant and meaningful visual cues. The different tasks used to investigate these skills include the visual-occlusion task, anticipation task, think aloud protocol, and visual-search tasks. Researchers using the visual-occlusion task have shown that experts are able to predict the placement of a shot, pass, or serve more accurately than novices (Jones & Miller, 1978; Paull & Glencross, 1997; Starkes, 1987). Starkes (1987) used this task with three different levels of field hockey players; international level players, varsity players, and physical education students. The players were presented with a videotape of a player dribbling the ball towards a goal. They were instructed to predict the area of a goal that a player on the videotape was shooting towards. The key component in this task was that the player shooting the ball was blocked out 150 msec prior to and 50 msec after contact with the ball. Overall, the results showed that when all of the players were exposed to stick-ball impact they predicted shot placement more accurately than if the stick-ball impact was occluded. However, and more importantly, when the stick-ball impact was occluded the experts were able to predict the shot placement more accurately than the other two groups. The author suggested that a distinguishing characteristic of sport experts is their ability to use visual cues in a highly efficient manner. "Skilled players are able to make use of advance visual cues to predict where a ball will be shot" (Starkes, 1987, p.157).

Similarly, studies utilizing the anticipation task have also shown that experts appear to use the visual information in a sport situation much more effectively than novices (Paull & Glencross, 1997; Williams et al., 1993, Williams & Davids, 1995). Williams and Davids (1995) showed a videotape of a soccer match to highly-skilled and low-skilled soccer players and physically disabled spectators. The videotape showed situations involving soccer players making passes up the field. The key component of this protocol involved painting a response reference grid on the soccer field that was video-taped. The grid was near one of the goals and was divided into 10 areas. All athletes were asked to predict which area on the soccer field the "highlighted" player (i.e., the offensive player with a black reference square enclosed around his body) would pass a ball. Response time and visual response errors were the dependent measures used to assess the players' anticipation ability. The results revealed that the experts differed from the two other groups in terms of the accuracy of their predictions (Williams & Davids, 1995).

Studies utilizing the visual-occlusion and anticipation tasks have provided some evidence that experts have greater skill in using visual cues to anticipate and predict specific sport scenarios. However, these studies seldom addressed how experts learn to do this or what cognitive strategies they used during a sport-specific activity. Several studies have described the different visual cues that experts and novices focus on during a sporting activity which imply the use of a systematic strategy. For example, experts in ice hockey (Bard & Fleury, 1981) tennis (Goulet, Bard, & Fleury, 1989) and baseball (McPherson, 1993) focus on different visual stimuli when performing a sport-related task. For example, Goulet, et al. (1989) presented videos of 27 random sequences of three types of tennis serves (i.e., flat, top-spin, and sliced) to both expert and novice tennis players. The subjects were required to correctly identify the type of serve as accurately and as quickly as possible. They also had to wear an eye movement recorder which identified the number of fixations on a specific cue during the tennis serve. In general, the results showed that experts identified more serves correctly and showed significantly more eye fixations than the novices (Goulet et al., 1989). More importantly, experts focused on qualitatively different parts of the serves than did novices when the players on the video were executing their serves. Experts focused their attention on the server's racquet and the arm holding the racquet and terminated their visual search after ball-racquet impact. Conversely, novices focused on the tennis ball significantly more often than experts and continued to follow the trajectory of the ball after the racquet struck the ball. These qualitative differences imply the use of distinctive cognitive strategies by tennis experts; however, they were not assessed directly.

Self-Regulation Differences

Even though the expert-novice differences described in the preceding paragraphs are important, they do not provide information about how athletes develop into highly skilled performers. A primary reason is because these studies focused predominantly on performance outcomes rather than learning processes. Outcome research typically describes the characteristics or attributes of experts, but not the processes through which they learned or mastered their skills. Process-oriented research is important because it reveals how experts developed their skills and thus has direct implications for interventions and training programs for novice athletes. For this reason, within the past few years several researchers have begun to analyze expert-novice process differences, particularly with regards to self-regulation processes (Anshel & Porter, 1995, 1996; Cleary & Zimmerman, 2000; Ericsson & Charness, 1994; Ferrari, Pinard, Reid, & Bouffard-Bouchard, 1991).

A few exploratory studies have shown that there are distinct self-regulatory differences between expert and novice athletes. For example, McPherson (1993) utilized the think-aloud protocol to assess expert-novice differences in the use of visual cues during a baseball task. Generally McPherson (1993) found that experts were much more focused on analyzing their own and opponent player processes while attempting to develop a successful performance strategy. An example of a statement made by an expert that focuses on opponents' processes was "Just watching what kinda ball he's comin' in with in what situation, and right now, um, just trying to learn what I think he's gonna do to me from the previous hitters" (McPherson, 1993, p.315). Thus, experts appeared to strategically focus on specific cues or stimuli (e.g., pitcher characteristics) in order to develop a plan on how to be successful against the pitcher. Conversely, the novices made significantly fewer statements about the pitcher and those statements which were made were very general and non-tactical. For example "Pitcher is not as confident looking as he was earlier"; "Just wait and see what happens (McPherson, 1993, p. 313). The novices approached the task in a less systematic way than experts because they did not use the visual information effectively in order to develop a strategy or plan on how to approach the pitcher. These findings suggest that experts may use self-regulatory strategies more frequently and efficiently than novices.

More recent studies have assessed expert-novice differences within the context of a self-regulatory framework (Anshel & Porter, 1995, 1996; Cleary & Zimmerman, 2000). Overall, these studies showed that experts exhibited more highly sophisticated forethought, performance control, and self-reflection phase processes during practice and competition than novices. In terms of forethought processes, experts appear to use more specific performance strategies (e.g., planning, focusing on form processes) than novices. For example, Anshel and Porter (1995), in their survey research with expert and non-expert swimmers, found that experts prefer to stick to the strategies of "swimming their own race" and "setting their own pace". More recently, Cleary and Zimmerman (2000) found similar findings in that experts used more specific shooting strategies (e.g., "to follow through", "to bend my knees") when practicing their free-throw shooting. Novices reported using no strategy or ineffective general strategies (e.g., "to concentrate"; "to focus"). Thus, because they plan to use more specific strategies before initiating a practice session, it appears that experts are more tuned into the specific processes that need to be monitored and adjusted in order to attain and maintain peak performance. Another forethought process that appears to differentiate expert and novice athletes is goal-setting. Experts set specific goals that often focused more on processes than outcomes. For example, Anshel and Porter (1995; 1996) reported that elite swimmers set more process goals (i.e., improving the swimming technique) than outcome goals (i.e., winning). Finally, experts exhibited higher levels of motivation to practice their sport skills than experts. For example, they had higher levels of self-efficacy and intrinsic interest (Cleary & Zimmerman, 2000) and "persevere with difficult sets and give more effort in training when they are tired (Anshel & Porter, 1995, p.103).

According to Zimmerman's three phase cyclical model, these forethought sub-processes set the stage for engaging in actions such as self-observation. Thus, given the above findings it seems reasonable to speculate that experts should self-monitor their performance processes and outcomes to a greater extent than novices. Even though only a few studies have investigated this issue, it does appear that experts self-monitor their performances in order to keep track of progress. Anshel and Porter (1995) indicated that "these results reflect a greater tendency of better skilled swimmers to engage in self-monitoring strategies than their less skilled peers" (p.104).

With regard to expert-novice self-reflection phase differences, experts again consistently displayed more positive and sophisticated self-regulation. As noted above, Anshel and Porter found that expert swimmers focus more frequently on previous performances in order to self-evaluate current performances than novices. In essence, they avoid making social comparisons. This self-evaluative approach is also adaptive during practice sessions because it conveys learning progress to the athlete as he or she practices or performs (Zimmerman, 1995). Anshel and Porter (1995) concluded that "elite athletes define 'success' as maintaining or improving their own performance standards rather than reliance on performance outcomes in which success is far more dependent on comparisons with opponents" (p.105). One study has also investigated expert-novice differences in terms of making attributions following failure (Cleary & Zimmerman, 2000). In general, experts attributed failed free-throw attempts to specific strategies significantly more frequently than non-experts or novices. This attributional pattern is highly adaptive because it will often preserve an athlete's motivation and will enable one to make strategic adjustments to improve future performances (Zimmerman, 1999).

In sum, self-regulation differences between experts and novices can be interpreted within the context of Zimmerman's three phase cyclical model of self-regulation. Experts display more sophisticated strategies, goals, self-efficacy beliefs, and intrinsic interest within the forethought phase. In terms of the performance control phase, they showed more self-monitoring and in terms of self-reflection phase, they displayed more effective self-evaluations and attributions. The primary implication here is that novices can be taught to use self-regulation strategies when practicing specific skills so they can attain a high level of success.

Analysis of the Influence of Self-Regulation Processes on Motor Learning

This section of the chapter will describe key self-regulatory processes within Zimmerman's Three Phase Model of Self-Regulation including strategy use, goal-setting, self-monitoring, self-evaluation, and making causal attributions. The self-regulation processes will be subsumed under one of the three phases: forethought, performance control, and self-reflection. Research demonstrating the relevance of these processes to improving motor learning will be presented and analyzed.

Forethought Phase Processes

Strategy Use. According to social cognitive theorists, strategy use or strategic learning is a cyclical, self-regulatory process that individuals use to exert control over their behavioral functioning and environment (Zimmerman, 1989; Zimmerman & Bonner, 1996). Since strategy use is a cyclical self-regulation process it is influenced by associated self-regulatory processes within the forethought (e.g., goal setting, planning), performance control (e.g., self-observation) and self-reflection (e.g., self-judgment and self-reaction) phases. Thus, the initial and continued use of a particular learning strategy is hypothesized to be influenced by a feedback loop characterized by setting specific goals, self-monitoring performance processes and outcomes, and making strategic attributions. Such a feedback loop allows an individual to monitor strategy effectiveness and to make adjustments or changes when one is not learning efficiently. Strategic planning and strategy use also depend on a variety of other personal (e.g., knowledge, affect) and environmental (e.g., modeling, verbal persuasion) influences (Zimmerman, 1989).

However, it must be noted that mere knowledge of learning strategies or understanding how to self-regulate does not ensure that individuals will be motivated to use them (Zimmerman, 1989; Zimmerman & Bonner, 1996). Social cognitive researchers have posited that strategic learning and motivation are interdependent processes that are both linked to underlying self-efficacy perceptions. Self-efficacy refers to a person's beliefs about his or her capabilities to organize and execute actions in order to attain particular standards of performance (Bandura, 1986). There is empirical evidence that individuals with high levels of self-efficacy are more likely to report using self-regulation strategies than those with low perceptions of self-efficacy (Cleary & Zimmerman, 2000; Zimmerman & Martinez-Pons, 1990). In essence, individuals with high self-efficacy perceptions will be motivated to pro-actively use and adjust strategies through progress monitoring and feedback in order to attain self-set goals.

Academic self-regulation researchers have identified numerous learning strategies that students often use to optimize their learning outcomes. For example, Zimmerman (1989) indicated that students use several different strategies to regulate personal, behavioral, and environmental influences including organizing and transforming information, seeking social assistance, reviewing records, and self-consequating. Although research analyzing the use of learning strategies to improve athletic skills is less extensive, there has been several recent studies that show that skilled performers rely on both cognitive and self-regulation strategies as they perform sport-specific tasks. For example, the following cognitive strategies have been shown to increase athletic performance: positive self-talk (Highlen & Bennett, 1983; Whelan, Mahoney, & Meyers, 1991), relaxation and anxiety reduction techniques (Williams & Leffingwell, 1996), and imagery techniques (Murphy, 1994). In addition, highly skilled athletes appear to rely on specific self-regulatory strategies to optimize their athletic performance (Cleary & Zimmerman, 2000; McPherson, 1993). For example, Cleary and Zimmerman showed that expert basketball players used specific techniques such as bending their knees, following through, and lining up their feet to the basket when practicing their free-throws. In addition, players flexibly modified and adjusted these strategies when they were not performing successfully. For example, after a couple of missed free-throw attempts, some players reported that they must 'keep my elbow in" and "make sure that I point my hand directly at the rim'.

Recent training studies have also shown that novices can be taught to use multi-step strategies in order to facilitate the learning of athletic skills. For example, Zimmerman and Kitsantas (1996) trained adolescent girls to use a multiple-step dart throwing strategy to improve their dart skill. In essence, girls who were encouraged to focus on executing all aspects of the throwing strategy were more successful and displayed higher skill than those girls who did not concentrate on using the strategy. In a similar study, novice dart throwers were taught to analyze the throwing process and to make adjustments in this motion when the dart missed the bulls-eye (Kitsantas & Zimmerman, 1998). When the dart missed high or low, the girls were taught to adjust the follow-through motion, but were instructed to adjust the verticality of their throwing motion if the dart missed to the left or right. Girls who followed this strategy, not only had better dart skill than the girls who were not taught this strategy, but also had higher self-efficacy beliefs and intrinsic interest (Kitsantas & Zimmerman, 1998).

Goal setting. A goal has been defined as the object or aim of an action. More specifically, researchers have identified a goal as the specific level of performance that an individual wants to attain, usually within a time limit (Locke & Latham, 1985; Locke, Shaw, Saari, & Latham, 1981). Although goal setting in sports received relatively little attention until the mid 1980's, it was a highly researched concept particularly in organizational settings and in laboratory experiments. This research served as the basis for the development of what is currently referred to as goal setting theory (Locke et al., 1981; Locke & Latham, 1985; Locke, 1990). A primary assumption of this model is that task performance is regulated directly by the conscious goals that individuals are aiming to accomplish for that task. Thus, in short, "goals are immediate regulators of human action" (Locke et al., 1985, p.126).

Goal setting research in sports and motoric activities has focused on three main properties of goals: 1) goal specificity, 2) goal difficulty, and 3) goal proximity. Goal setting theory postulates that specific goals will lead to greater achievement than general or "do-your best goals" because they direct activity more effectively, particularly self-evaluating one's performance (Locke & Latham, 1985; Schunk, 1990). Next, the more difficult the goal the more likely a person is to persist on a task and achieve at a higher level. Finally, short-term goals are usually more effective than long-term goals because they make it easier to develop specific strategies and they allow an individual to assess progress on a more frequent basis. There is much research support for each of these hypotheses (Lerner, Ostrow, Yura, & Etzel, 1996; Locke & Latham, 1990; Tubbs, 1986).

For example, Lerner et al. (1996) conducted a study with 12 female collegiate basketball players. Utilizing an A-B-A multiple baseline design, the authors investigated the effects of goal-setting on the players' free-throw performance over the course of the entire season. The girls were randomly assigned to one of three experimental conditions: 1) goal-setting, 2) imagery and 3) goal-setting and imagery. The dependent measure used across the baseline and treatment phases was the percentage of successful free-throws that a player made prior to a practice session. The goal condition involved setting specific goals in behavioral terms as well as setting difficult but realistic goals. Each player was asked to set a performance goal prior to shooting the 20 practice free-throws. In general, the goal-setting group out-performed the other two groups with respect to improving their free-throw percentage from the baseline to treatment phases (Lerner et al., 1996).

However, it must be noted that even though most goal-setting studies have supported Locke's basic premises, some studies have failed to find significant findings (Weinberg & Weigand, 1993). After critically analyzing these studies, Locke (1991) concluded that these null findings were due to methodological flaws and not due to inconsistencies in how goals affect athletic performance.

More recently, social cognitive researchers have supplemented the goal setting theory by drawing an important distinction between process and product goals (Bandura, 1986). Process goals usually involve techniques and strategies while product goals focus on outcomes or quantity of work (Schunk & Schwartz, 1993). For example, a process goal would involve focusing on mastering a five-step shooting strategy while a product goal may consist of making 8 out of 10 free-throws. Process goals are often more beneficial than outcomes goals because they focus the learner's attention on mastering essential form components of a strategy (Kitsantas & Zimmerman, 1998; Schunk & Schwartz, 1993: Zimmerman & Kitsantas, 1996;1997). In contrast, product goals will often impede an athlete's performance by diverting his or her attention away from important response components. This distinction is particulary important given that the current study trained basketball novices how to set process goals prior to practicing free-throws.

Schunk and Schwartz (1993) was one of the first studies to assess how process goals influenced student achievement and motivation differently than product goals. In general, they found that students who were taught to focus on learning a five-step writing strategy while practicing their writing skills showed higher achievement and self-efficacy than students who were given outcome or 'do-your best goals'. More recently, other social cognitive researchers have compared the impact of process and product goals on novice athletes' motivation and achievement in sport-related activities (Kitsantas & Zimmerman, 1998; Zimmerman & Kitsantas, 1996, 1997). Zimmerman and Kitsantas (1996) compared the effects of process and outcome goals on the dart skill, self-efficacy, and level of satisfaction of 50 novice dart throwers (i.e., adolescent girls). These girls were randomly assigned to one of four experimental conditions or a non-practice control group. The four experimental groups were formed based on two self-regulatory processes, namely setting goals (i.e., process or product) or self-recording performance processes (i.e., present or absent). All subjects received the same verbal instructions concerning how to correctly throw darts and, except for the control group, were given 12 minutes to practice dart throwing. Overall, girls who were in the process goal group (i.e., were told to focus on the last two steps for every dart throw) had higher scores across all dependent measures than girls who set outcome goals (i.e., were told to obtain the highest numerical score). Thus, novices are able to perform at a high level when they adopt process goals to learn a novel motoric skill. Zimmerman and Kitsantas (1997) supported and extended these findings by showing that novice dart throwers will benefit if they shift from process to outcome goals after some degree of automaticity in the throwing technique is achieved. The implication here is that as novices practice and refine their throwing techniques they will show greater performance levels, self-efficacy, intrinsic interest, and satisfaction with their performance if they shift from process to outcome goals. However, when initially learning a skill, outcome goals will adversely affect motoric performance and self-motivational beliefs.

Performance Control Phase Processes

Self-monitoring. Self-monitoring is a self-regulatory process that has been referred to as a process in which individuals deliberately attend to some aspect of behavior (Schunk, 1983) or responses that involve systematically monitoring their own performance (Zimmerman, 1989). One common method of self-monitoring is self-recording which involves keeping track of one's actions, thoughts, or reactions (Zimmerman, 1989). This process is distinct from informal self-monitoring, which consists of casual observations, because it involves systematic observations and judgments that enable an individual to assess goal progress. Thus, a swimmer who keeps a log of how fast he swims four laps or a basketball player who records the percentage of his practice free-throws attempts can use that information as an evaluative tool to assess goal attainment. In general, self-monitoring is a critical self-regulatory process because it "can greatly increase the proximity, informativeness, accuracy, and valence of feedback" (Zimmerman, 1999, p.10).

Self-monitoring is a performance control phase subprocess that is hypothesized to link forethought and self-reflection processes (Zimmerman, 1999). It is predicted to increase an individual's forethought self-motivational beliefs because it communicates goal progress or skill development (Zimmerman & Paulsen, 1995). Thus, a basketball player who self-records the percentage of his practice free-throws on a daily basis will be able to evaluate his progress more readily and if progress is achieved, will feel more efficacious about his shooting ability. Support for this premise comes from both academic and sport research. Schunk (1983) in his classic self-monitoring study, examined whether self-monitoring would impact elementary school childrens' self-efficacy to solve subtraction problems and their subtraction skill. All children received three 30 minute training sessions which involved instruction and individual practice sessions. In addition to this training, some children were taught to self-monitor the number of pages that they completed during each session. Another group of children were not given this self-regulatory training. In general, the self-monitoring group reported higher self-efficacy perceptions for correctly solving subtraction problems and had higher scores on a subtraction skill test than children who did not self-monitor (Schunk, 1983). The motivational effects of self-monitoring have also been demonstrated in the sport literature. Zimmerman and Kitsantas, in their series of studies, required adolescent girls to self-record the specific steps of a dart-throwing strategy that they performed successfully during a practice session. Overall, self-recording was significantly related to the girls' dart skill as well as a variety of self-motivational beliefs including self-efficacy and intrinsic interest (Zimmerman & Kitsantas, 1996, 1997). Thus, girls who were taught to self-record their performance processes reported higher levels of self-efficacy and intrinsic interest and mastered the dart-throwing strategy more effectively than girls who were not taught self-recording techniques.

Self-monitoring is also hypothesized to impact self-reflection processes including level of satisfaction and attributions following failure. When individuals are not reaching their self-set goals, it is critical for them to understand why their achievement attempts have not been successful. Self-monitoring provides the information necessary for an individual to make accurate attributions. It focuses a person's attention on important behavioral responses and facilitates identifying the strategies that are not leading to goal attainment (Zimmerman & Paulsen, 1994). For example, suppose a male high school basketball player wants to improve his shooting percentage and decides to record how successfully he performs various parts of a shooting strategy (e.g., bending knees, keeping elbow in towards his body). By keeping track of his execution of key shooting techniques, he would be more likely to attribute his failure to poor strategy execution, thus enabling him to make appropriate self-corrections (Kitsantas & Zimmerman, 1998). Recent studies showed that novice athletes who self-recorded their execution of motoric processes were most likely to make strategic attributions than athletes who did not self-record (Kitsantas & Zimmerman, 1998). In addition, there was an inverse relationship between self-recording and making ability attributions. Thus, girls who kept track of their motoric behaviors were less likely to attribute unsuccessful dart throws to ability. This is extremely important given that ability attributions have more negative motivational and achievement effects than attributions to strategy (Cleary & Zimmerman, 2000; Clifford, 1986; Zimmerman & Kitsantas, 1997).

Self-Reflection Phase Processes

Self-Evaluation. It is generally accepted that self-evaluation is a critical aspect of self-regulation because it allows people to gauge how well they are learning or performing on some task (Zimmerman, 1989). It has been defined as individuals systematically comparing their performance with a standard or goal (Zimmerman, 1999). In order to self-evaluate, an individual must first gather self-monitored information about their performance and then compare this information to specific standards. Zimmerman (1999) indicated that there are several types of criteria that individuals use to evaluate their behavior and performance: previous performance criteria, mastery criteria, normative criteria, and collaborative criteria. Previous performances are a type of self-criteria because individuals compare their current performances with earlier achievement levels. For example, athletes who compare their daily free-throw percentage with the previous day's free-throw percentage is using self-criteria to judge or evaluate their performance. This type of criteria is often beneficial because it highlights personal progress and focuses the athlete's attention to self-processes. Mastery criteria is another type of criteria that also highlights personal progress toward a standard of excellence (Zimmerman, 1999). It involves the use of scores ranging from novice to expert performance. For example, a novice basketball player will typically shoot from 20% to 40% from the free-throw line, while experts shoot over 70% (Cleary & Zimmerman, 2000). If novices adopted an expert's mastery criterion of 70%, they would evaluate their own level of mastery with this standard of performance.

The third type of criteria that individuals use to evaluate their performance is normative (Zimmerman, 1999). Normative criteria involves social comparisons with the performance of others. This type of criteria will often prevent individuals from effectively engaging in self-regulation because "they de-emphasize selective self-observations and conversely heightens attention to social factors (Zimmerman, 1999, p.12). Finally, collaborative criteria are typically team-related activities and involve how well a person fulfills a specific role (Zimmerman, 1999).

Although some academic research has investigated the effects of teaching students to self-evaluate by checking their math answers or rating their answers to an answer sheet (Zimmerman, 1989), very little research to date has been conducted to determine whether self-evaluation impacts an athlete's learning of motoric skills. However, Cleary and Zimmerman (2000) pilot-tested a few self-evaluation measures with expert and novice basketball players. After these players were asked how satisfied they were with their free-throw performance during the practice session, they were asked to indicate how they judged success or failure. Finally, they were also asked what percentage of free-throws they would have to make in order to feel completely satisfied. It was found that expert basketball players tended to use mastery criteria to evaluate their performance and to have higher performance standards when practicing their free-throws. Thus, it is of interest to investigate whether training novice athletes in forethought (i.e., goal setting, strategy use) and performance control (i.e., self-monitoring) phase processes will influence the type and level of standard that athletes set for themselves when practicing sport specific skills. The current study investigated this issue.

Attributions. When placed into an achievement situation or a situation in which an unexpected outcome occurs, individuals will usually try to figure out why they have failed or succeeded. These perceptions of causation are commonly described as causal attributions. Attributions are central to an individual's motivation as they influence self-efficacy perceptions, persistence, level of effort, and achievement level (Weiner, 1986; Schunk, 1989). Causal attributions are an important self-reflection process that influences the manner and extent to which a person self-regulates (Zimmerman, 1999).

A prominent attributional theoretical model was developed by Weiner (1972, 1986). In his original model, he described four attributions that are typically given following an achievement outcome: effort, ability, luck, and task difficulty. These attributions were grouped according to the locus of causality and stability dimensions. Locus of causality dimension refers to whether the perceived cause of an event or performance outcome rests internally or externally to the attributer. The stability category refers to the extent to which the performance outcome is perceived to be caused by something that is fixed or varies over times and circumstances (Weiner, 1972). These dimensions are important to consider because they "provide the psychological significance and meaning to the simple attributions" (Pintrich & Schunk, 1996, p.129). In 1986, Weiner re-formulated this model to include a couple of additional premises. First, he added a third dimension, controllability, which was originally hypothesized to be subsumed under locus of causality. This dimension refers to whether the cause is viewed as being under the control of the attributer or other people. Controllability is distinguished from locus of causality because personal outcomes can be attributed to internally controllable processes (i.e., situational effort) or to fixed internal traits (i.e., ability) (Weiner, 1986).

Within Weiner's model, most attributions fall easily into one of the three dimensions. However, there are some researchers who believe that outcomes may be attributed to other causes (i.e., strategies) that have not received adequate attention in this model (Clifford, 1986, Schunk, 1989). In addition, effort attributions were initially thought to have been the most motivating attribution because they are controllable and internal. However, if people put forth maximum effort on some task but still fail, they cannot attribute their failure to insufficient effort. This leaves them with uncontrollable attributions such as low ability which reduce their motivation. In order to avoid this dilemma, researchers have advocated teaching an alternative controllable and internal attribution, strategies, which remain adaptive in achievement settings despite failure when highly motivated (Clifford, 1986). Current research has shown that making attributions to strategy use preserves an individual's self-efficacy, facilitates and encourages self-adjustments when not performing well, and increase subsequent learning efforts (Cleary & Zimmerman, 2000; Clifford, 1986; Zimmerman, 1999).

Making attributions to inadequate strategy use was first studied by non-sport researchers (Anderson & Jennings, 1980; Clifford, 1986; Schunk, 1989). Anderson and Jennings (1980) analyzed whether attributing failure to ineffective strategies would lead to higher expectations of success than attributing the failure to uncontrollable factors (e.g., ability). In this study the subjects were given one of three types of training: strategic attributions, ability attributions, and no attributional training. In general, subjects who were taught to attribute failure at a persuasion task to ineffective strategies had more positive future expectations than individuals who made ability attributions (Anderson & Jennings, 1980). Clifford (1986) extended attribution research by comparing the effects of making effort and strategy attributions on students' attitudes, affect and future performance. Overall, strategy attributions led to more favorable and positive psychological reactions to failure than effort attributions.

Within the sport domain, researchers have shown interest in attributional theory (Cox, 1994; Gill, Ruder, & Gross, 1982). However, much of this research has focused on only attributions emphasized by Weiner and have not included strategy attributions as an alternative. Gill et al. (1982) found that most athletes on winning teams made controllable personal attributions (e.g., effort) as well as attributions relating to the team as a whole. More recently, researchers have started to examine the role that strategic attributions play in sustaining motivation and enhancing the achievement of individuals who engage in motoric activities. This research was conducted based on Zimmerman's (1999) three phase cyclical feedback model of self-regulation. This theory emphasizes the role of self-regulatory strategies during forethought, performance and self-reflections. Strategy attributions are viewed as a key form of self-regulation which sustains efforts to adapt. There is evidence to support this view. Cleary and Zimmerman (2000) showed that the attributions that basketball players make following two consecutive missed free-throws are highly correlated with their subsequent self-reactions (e.g., strategic adjustments). For example, players who attributed failure to specific techniques revealed that they need to improve that strategy in order to succeed on subsequent shots. Similarly, players who attributed failure to rhythm factors (e.g., "I was not in a flow") would concentrate on getting into a better rhythm on subsequent attempts (Cleary & Zimmerman, 2000). The implication here is that training athletes to make attributions to specific form processes will result in players making strategic adjustments during subsequent practice efforts.

Other social cognitive researchers have found strategic attributions to be related to a variety of other important self-regulatory processes such as self-efficacy, intrinsic interest, and satisfaction (Kitsantas & Zimmerman, 1998; Kitsantas, Zimmerman, & Cleary, 2000). Taken together, these findings suggest that making strategic attributions may not only result in a positive psychological profile but also may promote and facilitate engaging in self-regulated learning when learning motoric skills.

Influence of Self-efficacy on Motoric Learning

According to social cognitive researchers, self-efficacy is a key variable that influences an individual's motivation, achievement, and self-regulated learning (Bandura, 1997; Schunk, 1989; Zimmerman, 1989). It is defined as personal judgments of one's ability to organize and execute particular actions in order to attain specific performance standards (Bandura, 1986). Self-efficacy is similar to other self-concept measures such as perceived competence in that it is concerned to some extent with perceptions of personal capability (Zimmerman, 1995, 2000). However, it is distinct from other competency constructs (e.g., perceived competence and self-esteem) because it possesses several unique features. First, it involves judging one's capabilities to execute specific actions rather than general personal qualities (Zimmerman, 1995). Thus, self-efficacy differs from measures of self-esteem because the latter are concerned with how good a person feels about themselves, rather than how confident a person feels about performing specific behaviors (Pintrich & Schunk, 1996).

Another distinctive characteristic is that efficacy beliefs will often vary across specific domains such as the specific basketball skills of shooting, passing, and rebounding (Zimmerman, 1995). Thus, self-efficacy measures reveal a profile of beliefs about various sub-skills rather than a single overall measure. For example, a player may state that he or she is confident about shooting a high percentage of free-throws or passing the ball but may not feel efficacious if asked to shoot a three-point shot or to rebound the basketball. In essence, self-efficacy measures allow researchers to assess how confident a person feels about performing specific actions within a specific domain. Another unique feature of self-efficacy measures is that they are dependent on a mastery criterion of performance rather than a normative criteria (Zimmerman, 1995). This is a critical feature because mastery criteria focus an individual's attention to important learning processes rather than social outcomes of performance (Zimmerman, 1999).

The influence of self-efficacy has been studied extensively by academic researchers (Bandura, 1993; Pajares, 1996; Schunk, 1983; Zimmerman, 1995). In general, self-efficacy is a significant predictor of a student's motivation (i.e., persistence, intrinsic interest, and effort) and academic achievement (Zimmerman, 1995). In addition, several studies have examined the causal role of self-efficacy beliefs in influencing other self-regulatory processes. For example, individuals with high perceptions of self-efficacy will set more challenging goals (Bandura, 1986), set higher standards for themselves (Zimmerman & Bandura, 1994), demonstrate better ability to self-monitor (Zimmerman, 1995) and use specific learning strategies more frequently than individuals who have lower self-efficacy beliefs (Schunk & Schwartz, 1993).

The effects of self-efficacy have also been studied in by sport researchers. Self-efficacy has been shown to be a significant predictor of athletic achievement across a variety of different sports including basketball (Cleary & Zimmerman, 2000), gymnastics (Weiss, Wiese, & Klint, 1989), wrestling (Kane, Marks, Zaccaro, & Blair, 1996), dart-throwing (Kitsantas, Zimmerman & Cleary, 2000), and diving (Slobounov, Yukelson, &

O'Brien, 1997). Weiss et al. (1989) conducted a study with 22 males who were members of a competitive youth gymnastics club in order to assess the relationships between self-efficacy and gymnastics performance. Self-efficacy was assessed prior to competition, thus establishing self-efficacy as a predictor of athletic achievement. The results revealed that self-efficacy was a significant predictor of the athlete's performance on the high bars, pommel horse, floor exercise, parallel bars, still rings, and the vault (Weiss et al., 1989). Kane et al. (1996) examined the relationship between high school wrestler's self-efficacy for performing specific wrestling techniques (i.e., defending take-downs, pinning opponents) and their performance in wrestling matches. Two hundred and sixteen male high-school wrestlers, who attended a week-long wrestling camp, participated in the study. Prior to the beginning of camp, the researchers collected data about the wrestlers' prior wrestling performance (i.e., records from previous wrestling season) and self-efficacy. The wrestlers' camp performance (i.e., percentage of matches won by participants) and overtime performance (i.e., matches in camp which were decided in overtime) were recorded throughout the camp week. A major finding was that the wrestlers' self-efficacy, rather than their prior performance, predicted their performance during overtime matches. Consistent with previous researchers, the authors argued that self-efficacy beliefs influenced performance by raising individual effort and persistence in challenging situations (Bandura, 1982; Kane et al., 1996). Still further, other descriptive research has shown that the level of sport expertise is related to a player's self-efficacy (Cleary & Zimmerman, 2000). The authors assessed the player's self-efficacy prior to practicing their free-throws as well as during the practice session. They found that the basketball players' self-efficacy was related to their free-throw percentages.

In addition to being predictive of athletic achievement, a few studies have examined whether self-efficacy beliefs are linked to athlete's self-motivational beliefs and other self-regulation processes. The series of motor skill studies (i.e., dart-throwing) conducted by Zimmerman and Kitsantas, showed that self-efficacy consistently predicted the intrinsic interest and satisfaction of novice athletes. The higher the level of self-efficacy the more the adolescent girls valued dart-throwing and were satisfied with their performance. Cleary and Zimmerman (2000) supported similar findings in their study with expert and novice basketball players. Furthermore, they assessed the relationship between self-efficacy and both goal-setting and strategy choice. In general, high perception of self-efficacy was related to setting specific goals. The results also suggested that the specificity of the participants' strategies (e.g., "to keep my elbow in as I shoot) and goals were predictive of the players' self-efficacy judgments. Taken together, these findings suggest that high perceptions of self-efficacy in sports are linked to the specificity of the goals and strategies that athletes select to achieve their goals. This high level of specificity is important because it encourages self-regulation by enabling an athlete to engage more easily in self-monitoring and to make self-judgments and reactions. However, more research is needed to investigate the precise causal role that self-efficacy has in the execution of these self-regulation processes.

The purpose of the present study was to study the effects of training novice basketball players to use experts' self-regulation strategies during forethought, performance control, and self-reflection phases. Although several studies have analyzed the individual effects of specific self-regulatory processes (e.g., goal setting and self-recording), little attention has been devoted to analyzing the additive effects of these self-regulatory processes. Given that social cognitive researchers have shown that goal-setting and self-recording may lead to positive motivational and achievement gains, it seemed plausible to suggest that training athletes to use all three phases of the self-regulation model lead to even better performances.

There were three self-regulation groups and two control groups. The first group received self-regulation instruction in forethought, performance control, and self-reflection phase processes. The next group received instruction in forethought and performance control process whereas the final experimental group was only provided with instruction in forethought processes. There was also a practice control group and a no-practice control group, both of which did not receive any self-regulation instruction. It was hypothesized that the three phase self-regulation group would obtain the highest shooting skill score and display the most sophisticated self-regulatory profile. More specifically, the current study tested the following hypotheses:

H1: The three phase self-regulation group will surpass all other groups in terms of self-efficacy, intrinsic interest, satisfaction, and skill level.

H2: The two phase self-regulation group will surpass the one phase self-regulation group and both control groups on measures of self-efficacy, intrinsic interest, satisfaction, and skill level.

H3: The one phase self-regulation group will surpass both control groups on measures of self-efficacy, intrinsic interest, satisfaction, and skill level.

H4: All three self-regulation groups will evaluate their performance based on processes or self-criteria, while the control group will evaluate their performance based on outcomes or normative criteria.

H5: The three self-regulation groups will set higher standards for themselves than the two control groups.

H6: The three phase self-regulation group and two phase self-regulation group will make significantly more strategic attributions and adjustments than all other groups.

H7: Significant correlations among the self-regulation processes, within both the forethought and self-reflection phases, will be found.

CHAPTER THREE
METHODOLOGY AND PROCEDURES

Sample

This study consisted of fifty college students, 40 females and 10 males, drawn from physical education classes at a local college in a large Eastern City. The average age of the participants was 21.7 years while their ethnic composition was as follows, 32 Caucasian, 4 African American, 11 Hispanic, 1 Asian-American, and 2 Mixed Ethnicity. All participants were asked to participate by the examiner and consent forms were obtained. Participants were selected based on multiple criteria in order to help ensure that the individuals were novice basketball players. A participant qualified if he or she: 1) earned a pre-test shooting skill score of less than 25, 2) had not played organized, team basketball for a school beyond the 7th grade, and 3) displayed 3 or fewer shooting techniques taught in this study. One hundred fifty students were asked to participate: 27 declined to participate, 73 did not meet one or more of the criteria, and 50 met all of the inclusionary criteria. It should be noted that the majority of the individuals who did not meet at least one of the criteria were males. Most of these individuals did not qualify to participate in the study because they obtained pre-test shooting scores over 25.

Task Materials

The basketball shooting task consisted of a leather basketball and a two foot diameter basketball rim. The female subjects used a regulation women's basketball while the men used a regulation men's basketball. The participants were asked to shoot at the rim while standing behind a line that was 15 feet from the basket. The basket stood at a standard height of ten feet from the ground. The participants earned points ranging from zero to seven points depending on the outcome of their shots. The scoring criteria for the shots is described in the shooting skill measure section.

Measures

Shooting Skill. A test of shooting skill was designed to accuracy of the participants' free-throw attempts. The participants earned zero to seven points for each shot according to the following criteria: a) 7 points for swishing the shot (not hitting any part of the rim) b) 5 points for making the shot but the ball hit part of the rim or the backboard, c) 3 points for hitting the front or back of the rim and not making the shot, d) 1 point for hitting the side of the rim and not making the shot, and e) 0 points for completely missing the rim or hitting the backboard before the ball touches any part of the rim. All participants were given the opportunity to take 10 shots during both pre-test and post-test phases. Their shooting skill score was the average of these 10 shots.

Practice Improvement. A test of shooting improvement was developed to assess the participants' ability to improve their practice shots earning scores of 0 or 1 to scores of 3 or higher. During the 12 minute practice session, the examiner assigned a score of 0, 1, 3, 5, or 7 to each practice shot. The practice improvement score was the percentage of 0 or 1 scores that were followed by a score of 3 or higher. It should be noted that the middle 50% of shots was used to calculate this score while the initial and last 25% of shots were excluded. The initial 25% of the shots were excluded because they represented warm-up shots. The last 25 % of shots were excluded to rule out extraneous factors such as fatigue or boredom.

Self-Efficacy Scale. A measure of self-efficacy was developed according to the guidelines outlined by Bandura and Schunk (1981). The measure consisted of 3 items assessing the participant's confidence in making consecutive free-throws. All items began with the phrase, "On a scale from 0 to 100 with 10 being NOT SURE, 40 being SOMEWHAT SURE, 70 being PRETTY SURE, and 100 being VERY SURE, how sure are you that you will make . . . ?" This phrase was followed by one of three endings: 1) one of the next three shots, 2) one of the next two shots, 3) the next shot. These three questions were asked prior to the practice session as well as after the session. The participants were asked to orally respond to each question based on a 100-point scale broken down into 10 unit intervals. They were given a cue card, shown as Figure 2.0, depicting the scale as the examiner asked each question.

Figure 2. Self-efficacy Cue Card.

|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|

10 20 30 40 50 60 70 80 90 100

NOT SURE SOMEWHAT SURE PRETTY SURE VERY SURE

The examiner recorded the participants' efficacy judgments. Participants' scores for the three items were averaged to yield an overall self-efficacy estimate. According to Cronbach's alpha, the inter-item reliability of this 3 item scale was 0.97, surpassing estimates from previous research (Cleary & Zimmerman, 2000; Kitsantas & Zimmerman, 1998).

Intrinsic Interest Scale. A two-item measure was developed to assess the participants' interest in shooting free-throws. Both items began with the phrase, "On a scale from 0 to 100, with 10 being NOT INTERESTING, 40 being SOMEWHAT INTERESTING, 70 being PRETTY INTERESTING, and 100 being VERY INTERESTING, how interesting is . . . ?" This phrase was followed by one of two endings: 1) practicing free-throws, 2) shooting free-throws." The participants were asked to give oral responses to the questions while viewing a cue card with a written description of the 100 point scale. Figure 3 depicts this scale.

Figure 3. Intrinsic Interest Cue Card.

|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|

10 20 30 40 50 60 70 80 90 100

NOT INTERESTING	SOMEWHAT INTERESTING	PRETTY INTERESTING	VERY INTERESTING

The examiner recorded the participants' intrinsic interest ratings. The participants' scores for the two items were averaged to yield an overall intrinsic interest estimate. According to Cronbach's alpha, the internal consistency of this two item measure was .92.

Attribution Scale. The participants were asked to answer a question about the reasons for their unsuccessful free-throw attempts. Following two consecutive missed free-throw attempts during the post-test phase of the study, all participants were asked, "Why do you think you missed those last two shots?" The participants' verbal responses were recorded verbatim by the examiner and were categorized according to the reason for failure. These attributions were classified independently by two coders to one of 10 categories as delineated by Cleary and Zimmerman (2000): specific technique, general technique, confidence/ability, focus/concentration, effort, practice, rhythm, distractions, don't know, and other. An example of a specific technique attribution is "didn't keep my elbow in as I shot" while an example of a general technique attribution is "I did not use the shooting strategy." A focus/concentration response is "lost my concentration on what I was doing" whereas an effort response is "I was getting lazy." The practice category includes responses such as "I seldom practice free-throws" while rhythm responses include "I was too tense" and "I rushed the shots." An example of a distraction response is "the noise in the background bothered me." The category "other" refers to attributions that do not fit within any of these categories, such as "to do my thing" and when no attributions were made, the response was classified as don't know. The coders coded the participants' responses from unlabeled protocols to prevent scoring bias. Kappa analyses revealed an inter-rater agreement of .91 for the coded attributions. This is similar to the Kappa coefficient of .88 obtained in prior research using this coding system (Cleary & Zimmerman, 2000).

Strategic Adjustments. The participants were asked to answer a question concerning the strategy or plan that they need to use to perform well. The investigator asked the participants, "What do you need to do to make the next shot?" immediately following the attribution question. The participants' oral responses to this question were recorded verbatim by the examiner. The strategies were classified independently by two coders to one of nine categories. Because individuals often choose strategies based on their attribution responses, an attempt was made to create parallel categories within the attribution and strategy measures (specific technique, general technique, focus/concentration, effort, practice, rhythm, distractions, don't know, and other). However, the attribution category "ability/confidence" was not considered a strategy. The coders classified the participants' responses from unlabeled protocols to prevent scoring bias. Kappa analysis revealed an inter-rater agreement of .88 for the coded strategies. This is the equivalent inter-rater agreement value found in prior research (Cleary & Zimmerman, 2000).

Self-Satisfaction Scale. A one-item measure was used to assess the participants' satisfaction with their free-throw shooting performance during the practice session. After the participants finished the entire practice session, they were asked "On a scale from 0 to 100, with 10 being NOT SATISFIED, 40 being SOMEWHAT SATISFIED, 70 being PRETTY SATISFIED, and 100 being VERY SATISFIED, how satisfied are you with your performance during the practice session?" The participants were asked to orally respond to the question while viewing a cue card with a written description of the 100 point scale. Figure 4 depicts this 100 point scale.

Figure 4. Self-satisfaction Cue Card.

|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|

10 20 30 40 50 60 70 80 90 100

NOT SATISFYING SOMEWHAT SATISFYING PRETTY SATISFYING VERY SATISFYING

The examiner recorded the self-satisfaction judgments. It should be noted that this type of measure has been in used prior experimental research studies and has been shown to be related to a variety of other self-regulation constructs (Cleary & Zimmerman, 2000; Kitsantas & Zimmerman, 1998; Zimmerman & Kitsantas, 1996).

Self-Judgment Scale. The participants were also asked to answer two questions assessing how they judged whether they performed successfully or unsuccessfully. The first item assessed the criteria that the students used to judge their degree of satisfaction with their performance during the practice session. The participants were given a piece of paper with the following question: "What did you use to judge your degree of satisfaction?" and the following options: a) the performance of others, b) the percentage of shots you made, c) your use of the correct method or strategy, d) your improvement during practice, e) other factors, and f) don't know." After reading the question they were asked to orally indicate their answer. The examiner recorded the participants' responses onto the protocol.

The second self-judgment question examined the performance standard that the individuals set for themselves following the practice session. The examiner asked all participants the following question: "Based on this 100 point scale that we talked about earlier, what percentage of shots would you need to shoot in order to feel completely satisfied?" The examiner recorded the participants' responses. Both of these self-judgment questions were developed based on social cognitive research and theory on self-judgment as a self-regulatory process. This process is a central part of Zimmerman's Dynamic Feedback Model of Self-Regulated Learning.

Design and Procedure

This study consisted of five groups; three experimental groups and two control groups. The experimental conditions were based on the type of self-regulation instruction that the subjects received (i.e., setting goals, self-recording performance processes, making appropriate self-reflective statements) and included the following groups: a) a three phase self-regulation group b) a two phase self-regulation group c) a one phase self-regulation group. Subjects in the two control conditions did not receive any self-regulatory instruction. There was a practice control group and a no-practice control group. All of the participants were randomly assigned to one of the five conditions and were tested individually by an experimenter, who is a male doctoral student in psychology, in the gymnasium of the school that they attend.

During the first 10 minutes of the session the examiner provided shooting instructions and gave a demonstration on the correct shooting form. All five groups in the study received identical shooting instructions. These instructions included the following five steps. **Stance**: "*Stand behind the free-throw line so that your right foot is lined up with the right side of the rim and your left foot is lined up with the left side of the rim.* **The Grip**: "*Place your left hand on the side of the ball and your right hand in the center of the ball so that the tip of your middle finger is touching the black air hole.*" (For lefties read: "*Place your right hand on the side of the ball and your left hand in the center of the ball so that the tip of your middle finger is touching the black air hole.* **Elbow In**: "*Place your right elbow so that it is just touching the right side of your body. As you shoot, your elbow should be pointed directly at the rim*" (For lefties read: "*Place your left elbow so that it is touching the left side of your body. As you shoot, your elbow should be pointed directly at the rim.*" **Bend Knees**: "*Bend your knees so they come just over your toes. You should not be able to see your toes once you have correctly bent your knees. Once you reach your full knee bend straighten your legs up. As you are* *straightening your legs out, your shooting arm should begin to move straight up.*"

Follow Through: "*As your shooting arm straightens out, roll the ball off of your fingertips by flicking your shooting hand so that the palm of your hand is facing the ground. As you are following through, your shooting hand should be pointed directly at the rim.*"

Following this set of directions, the experimental groups received additional instruction that focused on self-regulation processes. The participants assigned to the three phase self-regulation group were instructed to set process goals (forethought process), self-record performance processes, and to make appropriate attributions and strategic adjustments following missed free-throws (self-reflection processes). Setting process goals involved focusing on properly executing the steps of the shooting motion. The examiner showed the participants a cue card delineating the process goal. The examiner read the goal to the students as they looked at the card: "*Your goal when practicing the free-throws is to focus on properly executing the following four steps: 1) grip the ball so that your middle finger of your shooting hand is on the black air hole and your non-shooting hand is on the side of the ball, 2) bend your knees, 3) make sure your shooting elbow is gently touching the side of your body and points directly at the rim as you shoot, 4) follow through straight at the rim.*" This group was also taught how to use a self-recording form in order to monitor the steps of the strategy that they were focusing on while shooting the shots. In essence, after every trial of two consecutive shots they were asked to write down the steps of the strategy that they focused on to perform well. The examiner stated: "*You will practice your free-throws in trials of two consecutive shots. I want you to write down the steps of the strategy that you were focusing on to* *perform well."* (The examiner showed the self-monitoring form to the participants). They were also instructed to record whether they missed any shots during each trial, the reasons why they missed the shots, and the strategies needed to make the next shot. The examiner modeled the process of making appropriate self-reflections through verbal instructions and by allowing them to refer to the Strategy Cue Card as they formulated their attributions and strategies. This cue card is shown in Figure 5.

Figure 5. Strategy Cue Card

The type of missed shot	POSSIBLE REASONS WHY THE SHOT MISSED
Ball to the left or right	1. You did not keep your elbow in 2. Your hand position was not in the center of the ball 3. Your follow through was not straight
Ball that is short	1. You did not bend your knees enough 2. Your follow-through was too flat
Ball that is long	1. You bent your knees too much. 2. Your follow-through was too hard

The examiner stated: *"When you miss a shot, you must also write down why you think you missed the shot. In order to help you figure out which step you did not execute refer to this cue card* (The examiner showed the Strategy Cue Card to the student). *This card will help you better understand why you missed a particular shot. For example, if the ball goes to the left or right it is probably due to your elbow not being straight or your hand not positioned in the center of the ball. If the ball is short, you're probably not bending your knees or you did not follow through. If the ball is too long, then you may have bent your knees too much or followed-through too hard. Finally, you should write down* *which step of the strategy you need to concentrate on in order to be successful on the next trial.*" It should be noted that the examiner modeled how to use the self-recording form before the students were asked to practice their shooting.

The participants assigned to the two phase self-regulation group received the same training as the three phase group except they were not given the Strategy Cue Card or instructions on how to make appropriate strategic attributions and modifications. As a result, their self-recording form did not have a space to record their attributions and subsequent strategy selection. The one phase self-regulation group received instruction on only forethought processes (i.e., setting process goals). Even though both of the control groups received the identical shooting instructions that the experimental groups were exposed to, they did not receive training in any of these self-regulation techniques.

Following the shooting instructions and self-regulation training, all experimental groups and the practice control group were given 12 minutes to practice their free-throw shooting. These groups were equated for practice time but not for the number of shots taken. This practice activity was followed by a post-test evaluation for shooting accuracy, self-efficacy, intrinsic interest, self-satisfaction, self-judgment, attributions, and strategic adjustments. Even though the no-practice control group did not practice their free-throws they were also post-tested across all dependent measures.

CHAPTER FOUR

RESULTS

Overall group differences across metric dependent variables were analyzed using univariate analysis of variance (ANOVA) procedures. However, analysis of covariance (ANCOVA) procedures were utilized to assess group differences across shooting skill and practice improvement with pre-test shooting skill serving as the covariate. A priori comparisons were conducted between 1) the three phase, two phase and one phase self-regulation groups and 2) each experimental group with the control groups. Chi-square analysis procedures were used to assess group differences for all categorical variables including attributions, strategic adjustments, and self-judgments. Finally, correlational statistics were utilized to examine the relationships between self-regulation processes within the forethought and self-reflection phases. Pearson coefficients were calculated among all metric dependent variables, point-biserial coefficients were used to assess the relationship between metric and categorical variables, and phi coefficients were calculated to assess the relationship between categorical variables. In addition, partial correlations were calculated between the shooting measures (i.e., shooting skill and practice improvement) and other dependent variables in order to adjust for pre-test shooting skill. Table 1 displays the post-test means and standard deviations for all metric dependent variables for each experimental condition.

Table 1. Post-test means and standard deviations for all groups

Time of Assessment	Three-phase	Two-phase	One-phase	Practice control	No-practice control
			Experimental group		
			Dependent measures		
			Shooting skill		
Post-test[a]	3.07 (0.24)	2.95 (0.24)	2.18 (0.24)	1.99 (0.23)	1.41 (0.24)
			Practice Improvement		
Post-test[a]	69.90 (7.18)	66.13 (7.20)	44.35 (7.40)	40.19 (7.08)	-- --
			Self-efficacy		
Post-test	24.67 (23.83)	32.33 (21.22)	27.00 (22.80)	27.50 (18.79)	34.17 (21.34)
			Intrinsic Interest		
Post-test	36.00 (29.61)	55.00 (19.40)	38.25 (24.27)	38.25 (25.44)	43.50 (24.50)
			Satisfaction		
Post-test	30.50 (27.74)	29.50 (18.78)	37.50 (20.98)	38.00 (24.06)	39.50 (30.23)
			Performance Standard		
Post-test	67.50 (20.71)	64.00 (18.39)	61.50 (11.32)	69.50 (18.63)	57.00 (23.71)

a – adjusted group means and percentages after controlling for pretest shooting skill

Group Differences in Self-Regulation Processes and Shooting Performance

One-way ANOVA procedures were used to assess group differences for the self-efficacy, intrinsic interest, satisfaction, and performance standard measures. The results revealed no significant differences between any of the groups.

ANCOVA procedures were used to assess group differences on post-test shooting skill, with pre-test shooting skill serving as the covariate. In general, the results showed significant group differences in shooting performance after statistically controlling for pre-test shooting scores, $F(5,44) = 8.09$, $p < 0.01$. A prior contrasts were developed to assess specific group differences. Dummy variables were used to code the contrasts and were entered into the General Linear Model function in SPSS as covariates. The results showed that the three phase group (M=3.07) differed significantly from the one phase group (M=2.18) ($p < .05$), the practice control group (M=1.99), and the no-practice control (M=1.41) (ps < .01) but not the two phase group (M=2.95). Thus, the participants who were taught to implement three self-regulation processes (i.e., setting goals, self-monitoring, and making process attributions) as they practiced free-throws, obtained a significantly higher shooting score than individuals who were only taught to set goals (i.e., one phase group) and those who were not taught to use these processes (i.e., control groups). However, the participants in the three-phase group did not shoot significantly better than those participants who were taught to set goals and self-monitor (i.e., two phase group). Similar to the performance of the three-phase group, the two phase group shot significantly higher scores than the one phase group ($p < .05$) and both control groups (ps <.01). It should also be noted that the one phase group obtained a significantly higher adjusted shooting skill score than the no-practice control group they did not differ significantly from the practice control group. Finally, even though group differences emerged across the shooting skill measure, the groups made an equivalent percentage of shots during the practice session and during the post-test.

ANCOVA procedures were also used to assess group differences across practice improvement, with pre-test shooting skill serving as the covariate. The no practice control group was not used in the analysis because they did not participate in the 12 minute practice session. Overall, the results showed that the adjusted differences in practice improvement among the four groups reached statistical significance, $F\ (4, 35)=3.76$, $p < .05$. Thus, at least one of the groups showed a higher rate of practice improvement than the other groups. A priori contrasts were used to assess specific group differences. The procedures used to code these contrasts were similar to the procedures used to code the contrasts for shooting skill. In general, the pattern of group differences observed for shooting skill was similar to the profile of group differences for practice improvement. More specifically, the three phase group (M=69.90%) and the two-phase group (M=66.13%) did not differ significantly from each other but obtained higher scores than the one phase group (M=44.35) ($p < .05$) and control group (M=40.19) ($p < .01$). Thus, individuals who set process goals and self-recorded their execution of shooting techniques during the practice session earned a score of 3 or higher following a 0 or 1 score more frequently than individuals who only set process goals or did not engage in these self-regulation processes. However, the practice control and the one-phase did not differ significantly, indicating that individuals who were taught to set process goals did not perform better than individuals who were not taught to set goals.

ANOVA procedures were also used to assess group differences in the number of shots taken during the 12 minute practice session. Table 2 displays the average number of practice shots that each group took during the practice session.

Table 2 - Average Number of Practice Shots Among the Training Groups

	Experimental Group				
	Three Phase	Two Phase	One Phase	Practice Control	No Practice Control
Number of Practice Shots	21	30	51	56	0[a]

a – The no practice control group did not engage in the 12 minute practice session

In general, the results showed significant group differences in the number of practice shots taken, F (3, 36)=58.82, p <0.01. Post hoc analyses revealed that the three phase group shot significantly fewer shots than the two phase group ($p<.05$) which in turn shot significantly fewer shots than both the one phase and practice control groups (ps <.01). The one phase and practice control groups took a significantly equivalent number of practice shots. The no-practice control group did not engage in the 12 minute practice session.

Correlational Analyses

Pearson correlation analyses were calculated in order to determine the relationship between the self-regulation metric dependent variables (i.e., self-efficacy, intrinsic interest, satisfaction). These correlation coefficients are presented in Table 2. As expected, self-efficacy correlated significantly with intrinsic interest, r = .41, p <.01, satisfaction, r = .32, p < .05, and performance standard, r = .28, p < .05. All other coefficients did not reach statistical significance. However, it should be noted that the correlation between intrinsic interest and satisfaction just missed significance at the .05 level (p=.07). The correlation coefficients are presented in Table 3.

Table 3. Pearson correlations among self-regulation metric dependent measures

Variable	1	2	3
Self-efficacy	-		
Intrinsic Interest	0.41**	-	
Satisfaction	0.32*	0.26	-
Performance Standard	0.28*	0.06	-0.14

* p < 0.05, ** p < 0.01

Analysis of Attributions

The participants' attributions for missing two consecutive shots were classified into 1 of 10 categories: specific technique, general technique, confidence/ability, focus/concentration, effort, practice, rhythm, distraction, don't know, and other. Table 4 presents the frequencies of the attributions across experimental and control groups.

Table 4. Frequency of attributions for experimental and control groups after two consecutive misses

	Experimental Group				
Attribution	Three Phase	Two Phase	One Phase	Practice Control	No Practice Control
Specific technique	10	7	1	3	1
General technique	0	0	1	0	0
Confidence/Ability	0	1	1	2	1
Focus	0	0	4	0	3
Effort	0	0	2	1	1
Practice	0	0	0	1	0
Rhythm	0	1	0	2	1
Distractions	0	0	0	0	1
Don't know	0	0	0	1	1
Other	0	1	1	0	1

In order to test for group differences, these 10 categories were collapsed into two attribution categories: specific technique and non-specific technique. Chi-square analyses revealed significant differences among training groups, chi-square (4) = 25.65, $p < .01$. Partitioning the chi-square revealed no significant difference between the three-phase and two-phase groups and no differences between the one phase, practice control, and no-practice control groups. As a result, the data were combined in order to form two groups.

Since none of the participants in the latter three groups were asked to self-record the technique processes, the combined group was subsequently labeled non self-recording. In contrast, since the participants in the three and two phase groups were required to self-record form processes, the combined group was labeled self-recording. In general, there was a significant difference between the combined self-recording group and the no self-recording group, chi-square (1) = 18.71, $p < .01$. Thus, individuals who were asked to self-record specific form processes were significantly more likely to attribute their missed free-throw attempts to specific techniques than the participants who did not self-record.

Point-biserial correlations between attributions following misses (i.e., categorized as technique and non-technique) and metric self-regulation dependent variables (self-efficacy, intrinsic interest, satisfaction, and performance standard) were calculated. None of these correlations reached statistical significance. Table 5 displays these correlation coefficients.

Table 5. Point biserial correlations between attributions and self-regulation metric variables

Variable	Self-efficacy	Intrinsic Interest	Satisfaction	Performance Standard
Technique Attribution	-0.09	0.15	-0.08	0.04

Partial correlations were calculated between attributions and shooting performance variables (i.e., shooting skill, practice improvement) in order to adjust for pre-test shooting skill. The correlations are presented in Table 6.

Table 6. Partial correlations between attributions and shooting performance variables

Variable	Shooting Skill	Practice Improvement
Technique Attribution	0.54**	0.49**

** $p < 0.01$

There was a significant, positive correlation between attributions and both shooting skill, $r = .54$, $p < .01$ and practice improvement, $r = .49$, $p < .01$. Thus, individuals who attributed their missed free-throw attempts to specific techniques shot their free-throws more accurately and showed greater improvement during the practice session than participants who attributed their misses to other factors.

Phi coefficients were calculated between attributions following failure and both strategies following misses and self-judgments. The nine strategy categories were collapsed into two categories (i.e., specific technique and non-specific technique) as were the six self-judgment categories (i.e., process and outcome). These results are presented in Table 7.

Table 7. Phi coefficients between selected attributions, strategy adjustments, and self-judgments

Variable	1	2	3
Technique Attributions	-		
Strategic Adjustments	0.80**	-	
Self-Judgments	0.35*	0.23	-

* $p < 0.05$, ** $p < 0.01$

There was a significant positive correlation between attributions and both strategic adjustments, $r = .80$, $p < .01$ and self-judgments, $r = .35$, $p < .05$. Thus, individuals who made specific technique attributions were more likely to make specific technique adjustments on subsequent shot attempts and to make process-oriented self-judgments. It should be emphasized that since the attribution questions preceded the follow-up strategy question, the correlation coefficient (i.e., $r = .80$) can be interpreted as attribution predicting strategy use. Thus, attributing misses to specific techniques was predictive of choosing a specific technique strategy to improve the next attempt.

Analysis of Strategic Adjustment

The participants' strategic adjustments following two consecutive misses were classified into 1 of 10 categories: specific technique, general technique, confidence/ability, effort, focus/concentration, practice, rhythm, distractions, don't know, and other. These frequencies are presented in Table 8.

Table 8. Frequency of strategies for experimental and control groups after two consecutive misses

	Experimental Group				
Strategy	Three Phase	Two Phase	One Phase	Practice Control	No Practice Control
Specific technique	8	7	2	3	3
General technique	0	0	1	3	1
Focus	1	2	5	2	2
Effort	0	0	0	1	1
Practice	0	0	0	1	0
Rhythm	0	1	1	0	1
Distractions	1	0	0	0	0
Don't know	0	0	1	0	1
Other	0	0	0	0	1

In order to assess group differences, these 10 categories were collapsed into 2 general categories; specific technique and non-specific technique. Chi-square analyses revealed significant differences among the experimental groups, chi-square (4) = 11.76, $p < .05$. Partitioning the chi-square revealed a similar profile of group differences found in the attribution analysis. Thus, no significant differences were found between the three-phase and two-phase groups as well as between the one-phase, practice control, and no practice control groups. The data were combined to form two groups; self-recording (i.e., three and two phase groups) and non self-recording (i.e., one phase and both control groups).

The results showed a significant difference between the self-recording group and non self-recording group, chi-square (1) = 9.55, $p < .01$. Individuals who were taught to self-record their execution of specific form processes made specific technique adjustments more frequently than those individuals who did not self-record their execution of their shooting technique.

Point-biserial correlations were calculated between strategic adjustments and metric self-regulation dependent variables (i.e., self-efficacy, intrinsic interest, satisfaction, and performance standard). None of these correlations reached statistical significance as displayed in Table 9.

Table 9 - Point biserial correlations between strategic adjustments and self-regulation metric variables

Variable	Self-efficacy	Intrinsic Interest	Satisfaction	Performance Standard
Technique Adjustment	-0.12	0.20	-0.05	-0.02

Partial correlations were also calculated between strategic adjustments and both shooting measures (i.e., shooting skill and practice improvement). The correlation coefficients are presented in Table 10.

Table 10. Partial correlations between strategic adjustments and shooting performance variables

Variable	Shooting Skill	Practice Improvement
Strategic Adjustments	0.40**	0.41**

** $p < 0.01$

Consistent with the results for attributions, significant, positive correlations emerged between strategic adjustments and post-test shooting skill, $r = .40$, $p < .01$ and practice improvement, $r = .41$, $p < .01$.

Analysis of Self-Judgments

The criteria that the participants used to judge the degree of satisfaction with their performance was assessed using a forced choice item with 6 categories; performance of others, percentage of shots made, use of the correct method or strategy, improvement during practice, don't know, and other. The self-judgment frequencies are presented in Table 11.

Table 11. Frequency of self-judgments for experimental and control groups

	Experimental Group				
Self-judgment	Three Phase	Two Phase	One Phase	Practice Control	No Practice Control
Performance of others	0	0	0	0	2
Percentage of shots made	3	9	8	7	6
Use of the correct strategy	3	1	0	1	1
Improvement during practice	3	0	2	1	0
Other	1	0	0	1	1

In order to assess group differences the 6 categories were collapsed into two categories: process and outcome. The process category included two responses (use of the correct method/strategy and improvement during practice) while the outcome category consisted of all other responses. Chi-square analyses revealed a significant difference among the experimental groups, chi-square (4) = 9.03, $p = .05$. Partitioning the chi-square revealed that the three phase group responded with process self-judgments significantly more frequently than the all other groups. In addition, there were no differences across these latter four groups.

CHAPTER FIVE

DISCUSSION

The present study examined the additive effects of goal setting, self-recording, and adjusting strategy use on novice basketball players' motivation and shooting skill. A micro-analytic on-line design was used to assess specific motivational and self-regulatory processes before, during, and after the participants practiced free-throws.

Training Group Differences in Shooting Performance

It was hypothesized that the individuals trained in self-regulation processes (i.e., one phase, two phase, and three phase groups) would shoot free-throws more accurately and consistently than individuals who were not trained in self-regulation processes (i.e., both control groups). In addition, the participants who received training in all three phases of self-regulation (i.e., goal setting, self-recording, and strategic adjustments) were expected to outperform individuals who were instructed in two self-regulation phases (i.e.., goal setting and self-recording), which in turn would display greater shooting skill than those participants who were exposed to only one phase of the self-regulation training (i.e., goal setting).

In general, the three phase and two phase groups displayed a higher level of shooting skill than the one phase group and both control groups. More specifically, individuals who set process goals and self-recorded the shooting techniques that they performed well during the 12 minute practice session, clearly outperformed individuals who practiced for 12 minutes without engaging in any self-regulation processes (i.e., practice control group). As expected, they also outperformed the participants who only set process goals (i.e., one phase group). These results are consistent with previous motor learning research assessing adolescent females during a dart throwing activity (Zimmerman & Kitsantas, 1996, 1997). In that research, the participants who were taught to set goals and self-record performance processes displayed greater dart throwing skill than those participants who only set process goals or did not use any self-regulation processes. That research also showed that setting process goals led to greater dart throwing skill than not setting any goals. However, this finding was not replicated in the current study. The current results revealed that individuals who were only taught to set process goals did not shoot more accurately than individuals who practiced for the same amount of time (i.e., 12 minutes) but did not set any goals. Thus, based on these results it appears that teaching novice basketball players to set process goals will have minimal effects on their shooting achievement. This discrepancy between current and prior research may be attributable, in part, to differences in the novelty of the tasks used in these studies. The subjects used in the prior research studies reported that they had no or minimal experience throwing darts. In addition, it is highly unlikely that these subjects were familiar with the correct throwing processes because they had few opportunities to observe dart-throwing models. Thus, dart throwing was truly a novel task for them. In contrast, the majority of the participants in the current study indicated that while they rarely played basketball, they had shot a basketball at some point during their lives (i.e., during gym class, with friends at local basketball court). In addition, due to the enormous exposure that basketball receives in our society (i.e., on T.V. and at college/high school campuses), these individuals probably had a general sense of effective shooting techniques. As a result, shooting free-throws was not a truly novel activity for most of them. The novelty of the tasks is an important issue to consider because process goals should have a greater impact on the achievement of individuals with little experience performing a particular motoric activity than individuals who already possess an understanding of some of the primary performance processes.

The group differences in shooting skill are even more interesting when one considers the average number of shots that each group took during the practice session (See Table 2). In general, the three-phase group took significantly fewer shots (M=21) than the two phase group (M=30), which in turn took significantly fewer shots than both the one phase (M=51) and practice control groups (M=56). The number of shots taken by these latter groups were statistically equivalent. The three and two phase groups took fewer shots because they were asked to engage in self-recording procedures during the practice session. Taken together, these findings indicate that even though the two and three phase groups shot significantly fewer practice shots than the one phase and practice control groups, they attained a higher level of shooting skill. One can reasonably conclude that the quality of shooting practice appears to be more important than the quantity of shots taken. Quality can be interpreted here as the extent to which individuals self-record their shooting techniques and adjust these techniques when they are not leading to success. In essence, it seems that mindful practice characterized by self-monitoring performance processes is more important than shooting large quantities of shots in a non-mindful manner.

With regard to practice improvement, a similar profile of group differences emerged. Practice improvement represented the percentage of 0 or 1 scores that were followed by a score of 3 or higher. In general, the three and two phase groups showed better skill at improving their poor shots (i.e., shots earning a score of 0 or 1) than the one phase and practice control groups. More specifically, the three phase and two phase groups improved upon their poor shots 69% and 66% of the time, respectively. In contrast, the one phase and practice control groups improved upon their 0 or 1 scores only 44% and 40% of the time, respectively. Thus, it appears that individuals who engaged in forethought (i.e., goal setting), performance control (i.e., self-monitoring), and self-reflection (i.e., strategic attributions and adjustments) or both forethought and performance control phase processes were able to make the adjustments necessary to improve the accuracy of their practice shots. On the other hand, individuals who were trained in only forethought phase processes or no self-regulatory processes had a more difficult time improving their shots. The apparent adjustments made by the three and two phase groups may have occurred because they had access to self-monitored information about performance processes. As a result, this information may have enabled them to self-reflect and self-evaluate their behaviors in a more strategic manner. (see Attribution and Strategic Adjustments discussion).

In sum, the two groups that were trained in at least two self-regulation processes (i.e., goal-setting and self-recording) displayed a higher level of shooting skill and a better ability to improve unsuccessful shots than individuals who only set process goals or did not receive any self-regulation training. More impressive is that these differences emerged even though the high achieving groups took significantly fewer practice shots than the other groups.

Training Group Differences in Self-Regulation Processes

The author examined group differences across two forethought phase processes (i.e., self-efficacy and intrinsic interest). In terms of group differences in self-efficacy, it was expected that all experimental groups would report higher perceptions of self-efficacy for making free-throws than both control groups. In addition, the three phase group was hypothesized to indicate a higher level of efficacy than the two phase group, which in turn would report higher perceptions of self-efficacy than the one phase group. Unexpectedly, none of these hypotheses were supported. Thus, regardless of the self-regulation instruction that individuals received, they displayed similar efficacy beliefs about making free-throws. Interestingly, this finding was not consistent with most social cognitive research assessing novice athletes (Cleary & Zimmerman, 2000; Kitsantas & Zimmerman, 1998; Zimmerman & Kitsantas, 1996, 1997). These prior studies found significant group differences in the subjects' self-efficacy judgments. The discrepancy between the current and prior research studies appears to involve two primary issues: 1) the correspondence between the scoring criteria and self-efficacy measures, 2) extent to which the subjects were informed of the scoring criteria. Previous social cognitive research used a self-efficacy measure that closely reflected the scoring criteria (i.e., 0 to 7 points). For example, the participants in these studies were asked to indicate how sure they were about scoring a 1) 7 with one dart, 2) 5 with one dart, 3) 3 with one dart, and 1) 1 with one dart. The authors also informed the participants that each of their dart throws would be scored according to this scale. The advantage of linking the scoring criteria and the self-efficacy measure is that it helped to ensure that individuals would be sensitive to small improvements in their shooting performance. In contrast, there was minimal correspondence between the self-efficacy measure and the scoring criteria used in the current study. For example, the participants were asked to indicate how sure they were about making 1) one of three shots, 2) one of two shots, and 3) the next shot. In addition, the author did not inform the subjects that each of their shots would be scored on a scale ranging from 0 to 7. As a result, the participants were left to assume that the success of their shots depended on whether they made or missed the shots. This lack of a refined outcome scoring system made all the participants insensitive to their improvement in performance. For example, even though the three and two phase groups obtained higher achievement scores than the other groups, they made a statistically equivalent percentage of shots during the practice session and on the post-test shooting skill measure. As a result, when asked to rate their confidence in making or missing a shot, all individuals reported similar self-efficacy judgments.

In sum, developing self-efficacy measures that closely reflect the scoring criteria used to evaluate athletic performance is a critical element in self-regulation research because it enables the athletes to be sensitive to subtle changes in their performance. This is consistent with Pajares (1996) who stated that, "self-efficacy beliefs should be assessed at the optimal level of specificity that corresponds to the criterial task being assessed and the domain of functioning being analyzed." (p. 547). In addition, informing the subjects about the scoring criteria is essential because it facilitates self-evaluation and other self-regulatory processes.

Another issue that may help to explain these non-significant differences involves whether the self-efficacy judgments reflect processes or outcomes. A distinction has been made in the literature between self-efficacy for achievement and self-efficacy for learning (Zimmerman, 1995, 1996). The primary difference between these types of efficacy judgments is that one focuses on outcomes (i.e., self-efficacy for achievement) while the other one focuses on processes (i.e., self-efficacy for learning). An example of the latter type of self-efficacy measure is: "How sure are you that you can improve your performance with more practice?" This item was pilot-tested at the end of the study, showing that the self-regulation groups felt more confident about improving their performance with practice than the control groups. Thus, future research on motoric learning needs to examine the importance and relevance of examining both self-efficacy for achievement and self-efficacy for learning measures.

The nonsignificant results for the intrinsic interest measure was also unexpected. However, given that the self-regulation literature is replete with evidence for the strong relationship between self-efficacy and intrinsic interest and that the experimental groups did not differ in terms of self-efficacy in this study, it is understandable that there were no group differences in intrinsic interest.

This study also assessed differences in the participants' self-evaluations (i.e., attributions and self-judgments) and self-reactions (i.e., strategic adjustments, satisfaction) to failed free-throw attempts. Following two consecutive misses, a significantly greater number of three phase and two phase individuals than one phase and control subjects attributed their failure to faulty shooting techniques (e.g., "I did not keep my elbow in as I shot"). One hundred percent of the three phase group and 70% of the two phase group made this type of attribution, in comparison to only 10% of the one phase group, 30% of the practice control and 10% of the no-practice control group. This attributional pattern is highly beneficial because it reassures the athlete that future performances can be improved through adjusting faulty strategies (Cleary & Zimmerman, 2000). It should be noted that a greater number of three phase individuals than two phase individuals reported specific techniques as the cause for their missed shots. However, this difference did not reach statistical significance at the .05 level (p=.06).

The three phase and two phase groups also selected more specific, technique strategies following these two misses than the participants in the other three groups. Eighty percent of the three phase group and 70% of the two phase group indicated that they needed to focus on specific techniques (e.g., "to grip the ball correctly") in order to make the next shot. In contrast, only 20% of the one phase group and 30% of both control groups adopted a specific strategy. Typical responses endorsed by these groups included "I don't know", "to concentrate more", and "to do the strategy". These latter strategies will typically not help athletes self-correct faulty techniques because they are too general and will often divert attention away from essential shooting techniques (Cleary & Zimmerman, 2000).

Another type of self-evaluation investigated in this study was self-judgments. The author examined the criteria that the participants used when evaluating their performance. Although it was hypothesized that all self-regulation groups would use criteria that reflected a process or learning orientation, the results showed that the three phase group used this type of criteria significantly more frequently (60%) than the two phase group (10%), one phase group (20%), practice control group (20%) and the no-practice control group (10%). Due to the significant differences between the three phase and both the two phase and one phase groups, one can conclude that setting process goals or combining goal setting with self-recording is not sufficient in influencing the participants to evaluate performance outcomes based on self or process-oriented criteria. Furthermore, adding attributional and strategic adjustment training to both goal setting and self-recording training appears to be the key component in producing these effects. Using process criteria (e.g., "use of the correct strategy" and "improvement during the practice session") to judge satisfaction is beneficial because it conveys personal progress and focuses the athlete's attention on self-processes. In addition, it is consistent with a task orientation that involves focusing on processes rather than outcomes and viewing success as something that is based on learned skills rather than 'fixed' abilities. This orientation has been shown to be related to a variety of motivational and achievement variables in sports (Fox, Goudas, Biddle, Duda, & Armstrong, 1994; Williams & Gill, 1995).

Another self-judgment process analyzed in this study was the standard of performance that individuals set for themselves following the practice activity. To this author's knowledge, a performance standard measure has not been used in motor learning research. It was hypothesized that the self-regulation training groups would establish higher standards than the control groups. This prediction was made based on Cleary and Zimmerman's (2000) pilot test, showing that expert basketball players, who utilized self-regulatory strategies, may set higher standards when practicing their free-throw shooting than non-experts or novices (Cleary & Zimmerman, 2000). Unfortunately, the results did not support this hypothesis as groups set comparable performance standards.

In sum, although the three phase and two phase groups displayed the highest level of shooting skill and practice improvement than all other groups, the three phase group displayed a more adaptive motivational profile than the two phase group with regards to attributions and self-judgments. These differences are important because making strategic attributions and using self or process criteria to judge one's performance helps create a mindful athlete who is able to adjust and modify their shooting techniques when they struggle.

Self-Regulation Model

Another important aspect of this study was to analyze the relationships among the various self-regulatory processes within the forethought and self-reflection phases. The only forethought phase processes analyzed in this study were self-efficacy and intrinsic interest. Consistent with many studies, self-efficacy was predictive the participants' intrinsic interest (Zimmerman, 1996). Thus, individuals who were highly confident about their chance of making free-throws displayed high levels of interest in shooting and practicing free-throws.

With regards to self-reflection phase processes, the author was interested in assessing the relationships among attributions, strategic adjustments, and self-judgments. Since the attribution question was asked prior to the strategic adjustment question, the author examined how the participants' attributions following two consecutive failed free-throw attempts influenced their subsequent strategic adjustments. According to Zimmerman's Dynamic Feedback Model of Self-Regulation, attributions are hypothesized to influence the adjustments that individuals make before future efforts (Zimmerman, 1999). Consistent with previous motor learning research (Cleary & Zimmerman, 2000), the results showed that individuals who made specific technique attributions following missed free-throws (i.e., "I did not bend my knees") reported that making adjustments in their techniques (e.g., "To bend my knees more) was necessary in order to make the next shot. In contrast, participants who did not attribute their missed shots to specific techniques rarely reported the need to adjust their shooting techniques in order to improve their shooting performance. More specifically, 91% of those individuals who reported specific technique attributions indicated that they needed to adjust that respective technique on the subsequent shot. However, only 11% of those individuals who provided a non-technique attribution indicated that strategic adjustments are necessary in order to improve their shooting performance. Establishing a strong relationship between attributions and strategic adjustments is theoretically important because it supports the assumption that attributions influence the strategies that individuals select to improve their performance.

Attributing failure to specific techniques and adjusting these techniques to improve one's performance enhances motivational states because it communicates to athletes that failure or poor performances can be improved by strategies that are under their control. These self-reflection processes are also important because they are highly related to both shooting skill and practice improvement. For example, those participants who made technique attributions and adjustments were more likely to obtain a high shooting skill than those subjects who did not identify specific techniques as the cause of their missed shots. More importantly, self-reflecting on performance processes was positively related to the improvement of the participants' shots during the practice session. Thus, the individuals' ability to improve a score of 0 or 1 to a score of 3 or higher on the next shot was related to attributing failure to specific techniques (e.g., "I did not bend my knees", "My elbow was out") and then adjusting these techniques during subsequent shot attempts.

Another benefit of making technique attributions is underscored in its relationship to using process or self- criteria to judge satisfaction with shooting performance. For example, it was found that 41% of individuals who attributed their missed shots to specific techniques used process-oriented criteria (e.g., "mastery of the shooting method" and "improvement during practice") to judge their degree of satisfaction. On the other hand, only 11% of the participants who made non-technique attributions used outcome or normative based criteria to judge their shooting performance. Focusing on processes rather than outcomes is important because it helps athletes become more mindful of what and how they are doing something rather than simply their attained success. This mindful approach to practicing free-throws is a key factor in enabling individuals to self-regulate their practice related behaviors.

Summary

Training novice basketball players to use forethought and performance control phase processes appear to be essential factors in facilitating the players' shooting skill achievement. However, players who were taught to think and behave in a full cyclical manner (i.e., to use forethought, performance control, and self-reflection phase processes) not only improved their shooting skill but also adopted a more adaptive learning orientation characterized by making strategic attributions and adjustments and using process/self criteria to evaluate their performance. This motivational profile is important because it helped the participants focus on the essential form processes necessary for becoming a successful free-throw shooter. Although the two phase group exhibited some aspects of this motivational profile, they were not completely focused on performance processes. Thus, engaging in the forethought and performance control phase processes during motoric practice efforts is beneficial, but not as advantageous as engaging in the complete self-regulatory feedback loop.

Educational Implications

One of the primary reasons for conducting this study was to determine whether mindful practice sessions produced better shooting skill than non-mindful sessions. In general, the results showed that the quality of one's practice session (i.e., the extent to which one self-regulates) is more important than the quantity of shots taken. This is important given that informal interviews with high school basketball coaches showed that they unwittingly advocate a non-mindful approach to practicing free-throws. For example, during a typical practice session, the coach would periodically ask all of his players to shoot 20 to 30 free-throws. Thus, during a typical practice session, players may shoot between 75 and 150 free-throws. However, the coaches revealed that they do not provide performance process feedback and do not ask the players to self-record their execution of shooting techniques. Thus, the coaches were advocating the players to shoot a large quantity of shots but in a non-mindful manner. This is important when one considers that many of these players did not improve their shooting over the course of the season and only a handful of players had a free-throw shooting percentage better than 70% (Cleary & Zimmerman, 2000). Therefore, it appears that coaches may need to adjust their strategies to improve the player's free-throws. Based on this study, an effective practice strategy may involve teaching the players to self-record performance processes and to make strategic attributions and adjustments.

In addition to training athletes to self-monitor their performance outcomes and processes, coaches should provide the players with an objective, well-refined criteria system so that they can effectively judge improvements in their performance. The benefit of encouraging the players to evaluate their performance based on this type of criteria (i.e., scoring system ranging from 0 to 7 points) is that they would be more sensitive to subtle improvements in their performances. As a result, they would be more mindful of when a specific shooting technique is working or not.

Limitations of Study and Areas of Future Research

Although many important conclusions were drawn, this study has several limitations. First, the author asked only college aged novice basketball players to participate in the study and used free-throw shooting as the motoric activity. As a result, it is unclear how well the findings will generalize to other motoric activities and populations. Future research needs to extend this research by assessing the impact of self-regulation techniques as novice athletes perform other motor activities (e.g., golf putting, tennis serve).

The effects of self-regulation training obtained in this study were powerful in that the players had only 12 minutes to practice their shooting techniques. However, because this training session was brief it is difficult to draw any conclusions about the effects of self-regulatory training during an extended practice session or multiple practice sessions. If the practice session was extended to 20 minutes it is possible that the one phase group would have outperformed the practice control group because they would have had more time to accomplish their goal of properly executing the different steps of the shooting strategy. In addition, it would be interesting for future research to determine if multiple practice sessions would result in greater shooting achievement for the three phase group than the two phase group. This is a distinct possibility given that the three phase group was more focused on processes and had more training in the specific reasons why a shot missed and how to make strategic adjustments.

Although the relationships between technique attributions, strategic adjustments, shooting performance measures, and other self-regulatory processes were calculated, it was difficult to analyze the predictiveness of attributions because it was asked because it was asked after the post-test shooting skill assessment. In order to draw conclusions about this measure, future research should modify the protocol used in this study so that the attribution question is asked after the practice session but before the post-test. When utilizing a micro-analytic design, the temporal sequence of questions is critical in determining the predictiveness of variables.

Another goal of future research should be to determine the role of self-efficacy in regulating the participants' motivation and achievement. The self-efficacy measure used in this study did not correspond closely to the scoring criteria, resulting in non-significant differences among the training groups. In addition, this study did not make a distinction between self-efficacy for performance (i.e., outcomes) and self-efficacy for learning (i.e., processes). It would be interesting to determine if training in self-regulation techniques has differential effects on the participants' self-efficacy for learning and self-efficacy for outcomes.

Finally, an issue that, to the knowledge of this author, has never been investigated involves assessing the appropriateness of the strategic attributions and adjustments that individuals report following missed free-throw attempts. That is, is the reason that players give for missing a shot an accurate self-reflection? In this study, only a few of the individuals in the practice control and one phase group reported specific technique attributions following two consecutive misses. However, although focusing on performance processes is a critical element to improving performance, their attributions were often incorrect. For example, after hitting the backboard with a shot (i.e., score of 0), a few of these players attributed their misses to "my grip was off." This attribution is clearly not correct because the grip is not the primary determinant of the ball traveling too far. In contrast, many of the participants in the three phase group who hit the backboard, typically attributed their missed shot to "my follow through was too hard" or "my arm did not extend upwards." These latter responses are clearly more adaptive and functional because they will often determine how far the ball will travel. The response of the practice control and one phase groups usually corresponds to a shot that hit the left or right side of the rim. Thus, future research needs to go beyond assessing only the type of attribution that a player makes (e.g., technique and non-technique) and begin to also focus on whether this attribution was correct.

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