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**Self-Regulated Learning of Motoric Performance:**

**A Comparison of Two Models**

**by**

**Anastasia Kitsantas**

**A dissertation submitted to the Graduate Faculty in  
Educational Psychology in partial fulfillment of the  
requirements for the degree of Doctor of Philosophy,  
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## Abstract

## Self-Regulated Learning of Motoric Performance:

## A Comparison of Two Models

by

Anastasia Kitsantas

Adviser: Professor Barry J. Zimmerman

This study compared and examined the effects of Singer's (1988) Five Step Model of Self-Regulated Learning and Zimmerman's (1995) Dynamic Feedback Model of Self-Regulated Learning on motor skill acquisition using ninety high school females. Three components of these two models were studied: strategy (imaginal versus analytic), goal setting (fixed versus dynamic) and self-evaluation (absent or present). It was hypothesized that girls who adopted components of Zimmerman's model would exceed those girls who adopted components of Singer's model in dart-skill, self-efficacy beliefs, self-reactions and intrinsic interest. Support for all hypotheses were found. Results provided strong evidence that Zimmerman's model is more effective than Singer's model in enhancing not only the girls' dart-skill but their self-efficacy perceptions, self-reactions and intrinsic interest. Correlations showed that self-efficacy beliefs were highly correlated with dart throwing

skill, self-reactions and intrinsic interest. Girls who self-evaluated reported significantly more strategy attributions than did those who did not self-evaluate. These strategy attributions were highly correlated with dart-skill, self-efficacy, positive self-reactions and intrinsic interest in dart throwing. Findings are discussed in terms of a social cognitive view of self-regulated learning of complex motor skills. Instructional applications of the findings for educators and coaches were also considered.

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## CHAPTER 1

## INTRODUCTION

During the past two decades, investigators have studied human self-regulatory processes in many areas of personal functioning, such as physical health (O'Leary, 1985; Clark & Zimmerman), mental health (Thoresen & Mahoney, 1974), exercise adherence (Kingery, 1990), and athletic performance (Chen & Singer, 1992; Kirschenbaum, 1984; Ferrari, Pinard, Reid, & Bouffard-Bouchard, 1991). Self-regulation refers to systematic efforts to set goals, observe oneself, and self-correct one's functioning. Throughout these studies, it has been shown that, self-regulation is a powerful technique for optimizing one's effectiveness.

Self-regulatory processes have been used also to improve one's learning, particularly complex skills that require considerable individualized practice (Schunk, 1983; 1989; 1990; 1991; Zimmerman & Martinez-Pons, 1992; 1986). Students who can self-evaluate knowledge and skill deficits, set practice goals for themselves, choose optimal learning strategies, and self-monitor progress have distinct advantages over students who must rely on others to learn. This is especially true for the acquisition of competitive athletic skills where small advantages can make the difference between winning and losing. Evidence has been reported that self-regulatory processes such as self-

evaluation, goal setting and self-monitoring do improve complex motoric learning, and several models to self-regulate learning have been formulated to date, which share some features and differ in other ones (Ericson & Charness, 1994; Singer et al., 1989; Kirschenbaum, 1984; Zimmerman, 1995a). However, there has been little effort to examine the relative effectiveness of these models to date, and this is the purpose of this dissertation.

#### A Definition of Self-Regulated Learning

Zimmerman, (1989; 1995b) has defined self-regulated learning as "self-generated thoughts, feelings, and actions that are systematically designed to influence one's acquisitions of knowledge and skill". Learners are self-regulated to the degree that they metacognitively, motivationally, and behaviorally able to control their own learning process (Zimmerman, 1989). First, metacognitively, self-regulated students enhance their learning through self-regulatory processes such as goal-setting, organizing, self-monitoring and self-evaluating during learning. Second, motivationally, these students self-initiate activities, report high levels of self-efficacy and display effort and persistence until the learning task is completed. Finally, behaviorally, these students restructure their environment for optimal learning, seek out information and advice, and self-reinforce during performance.

Central to the self-regulation model is the use (1) of

learning strategies and (2) the existence of a "feedback loop". Self-regulated learning strategies refer to "actions and processes directed at acquisition of information or skills that involve agency, purpose, and instrumentality perceptions by the learners" (Zimmerman, 1990). Categories of different strategies include goal-setting, environmental structuring, organizing, seeking information, and social assistance. Self-regulated learners are aware of the important role that these strategies can play in acquiring skill and achieving their personal goals.

The "feedback loop" involves a cyclic process in which students monitor the effectiveness of the strategies being used. This feedback loop or evaluation process allows students to compare their performance on different tasks with their predetermined goals or standards. Based on the type of feedback (positive or negative) received, students keep effective strategies or replace ineffective ones with better ones when needed. Because learning is an inherently dynamic process, learning strategies must be continually revised and this is why the feedback loop is critical to success.

#### Why is Self-Regulation Important for Motor Performance?

During the last decade, psychological research concentrating on sport, exercise and physical activity has focused on self-regulatory processes, such as goal-setting, self-monitoring and self-evaluation. The degree to which

athletes can orchestrate and assume personal control of these processes seems to be a central element in maintaining and reaching optimal levels of performance (Zimmerman, 1989; Chen & Singer, 1992). Garfield and Bennett (1985) stated that when personal orchestration of peak performance skills is in effect "a powerful synthesis of human capabilities is elicited from within the individual, and it is at this point that the doors of that person's hidden reserves are flung wide open". Advantages, such as excellent physical conditioning, proper technique, a good coach and the optimal equipment can enhance athletes' performance, but are insufficient by themselves to attain optimal performance.

In spite of the growing body of research suggesting the importance of self-regulated learning, most teachers and coaches still rely on traditional approaches for teaching motor skills. These approaches, which concentrate on group rather than individual performance, fail to teach students personally how to acquire motor skills, adhere to their training programs, and achieve peak performance. As a result, students seldom learn to self-regulate their own physical development. Recent evidence reveals the poor participation rates of Americans in physical activity or sports. The U.S. Public Health Service reports that 90% of adult Americans do not get sufficient exercise and the Journal of the American Medical Association reports that fewer than 10% of Americans older than 18 years meet the

criteria for participation in physical activity or sports proposed in the 1990 objectives of the nation.

Given this dismal record of physical training it appears that teaching individuals to take personal responsibility of their own learning process is an essential element in the instruction of motor skills or exercise programs. That is, teaching individuals to set goals and subgoals for the particular skill or workout to learn, plan how to go about achieving these goals, self-monitor and evaluate their accomplishments based on their standards and then, change their performance accordingly will motivate them to participate in sports and/or physical activity, and encourage them to adhere to this type of behavior, long enough to achieve the desired outcomes.

#### Models of Self-Regulated Learning in Motor Learning

But, how can students be taught to self-regulate? Within the last decade, researchers have developed a few models of how students become masters of their own learning processes. Perhaps the first model of self-regulation in sports and exercise was developed by Kirschenbaum in 1984. This model consists of five sequential stages: (1) problem identification, (2) commitment, (3) execution, (4) environmental management and (5) generalization. During the first stage the athlete specifies the nature of the problem to be solved, such as shooting free throws in basketball more accurately. In the second and third stage, the learner

establishes a commitment to change and executes the components of the throwing motion including self-monitoring and self-evaluation of outcomes. During the fourth stage, the athlete attempts to control his or her social and physical environment to facilitate change, such as finding a place to practice without being distracted by other players. Finally, in the fifth stage, the athlete generalizes the positive behaviors that were acquired in the previous stages to new situations, such as during competitive games.

There are several limitations of the Kirschenbaum (1984) model. This model focuses on overt behavior and gives relatively little attention to covert processes, such as imagery, relaxation, and conscious processes. It does, however, focus on the role of the environment and the need to plan for the transfer of the skill.

Many of these covert processes have been included in Singer's (1988) Five-Step Model of Self-Regulated Learning. According to this model, learners are instructed to (1) relax and try to get ready to perform the task, (2) use an imaginal strategy, such as visualizing the perfect model, (3) focus exclusively on a fixed cue to screen out distracting thoughts, (4) execute the task without conscious attention, and (5) evaluate if time permits (see Figure 1). According to Singer and Cauraugh (1985) this model was formulated on the basis of interviews with professional athletes, and related research findings. This formulation

focuses on self-regulating affective and conscious processes, so they don't interfere with motoric execution. It seeks to help athletes achieve a mental "zone" where motoric performance can occur unconsciously.

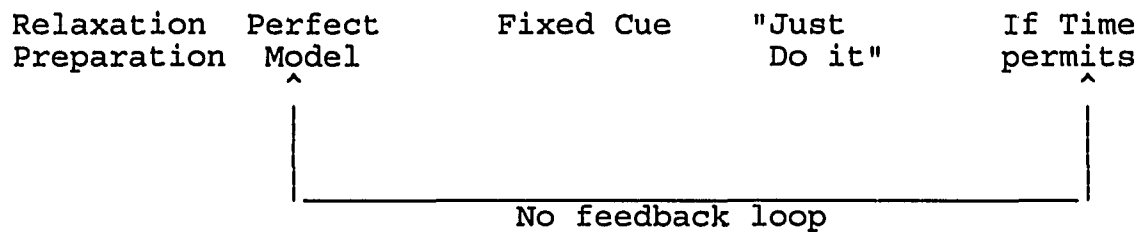
An alternative model was recently developed by Zimmerman (1995a) on the basis of Bandura's (1986) social cognitive theory. This model, which is known as the Dynamic Feedback Model of Self-Regulated Learning, views motor learning as a cyclic process that involves strategy use, goal-setting, self-monitoring and self-evaluation respectively. Learners consciously self-monitor their performance and analyze key processes via a cyclic feedback loop (see Figure 1).

Zimmerman's model assumes that motoric self-regulation grows initially out of social learning experiences, especially observing skilled athletic models (Zimmerman & Bonner, in press). According to this theory, there are four distinctive phases in the development of self-regulated strategic learning: strategy observation, imitation, self-control and self-regulation.

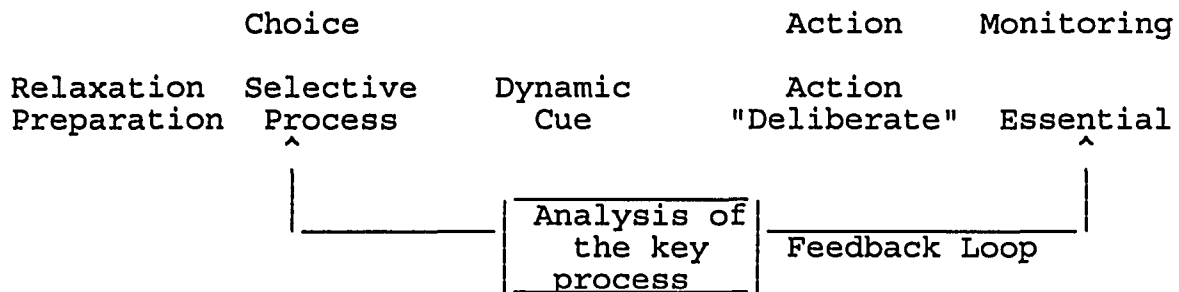
During the first phase, strategy observation, the student learns through observation of a model. For example, a novice basketball player may notice from observing an expert performing a free throw that, the proper arc on the ball requires an inverted wrist position before the release.

Figure 1Models of Self-Regulated Learning**SINGER'S FIVE-STEP MODEL OF SELF-REGULATED LEARNING**

Readying--->Imagining--->Focusing--->Executing--->Evaluating

**ZIMMERMAN'S DYNAMIC FEEDBACK MODEL OF SELF-REGULATED LEARNING**

Readying-->Strategy--->Goal Setting-->Goal-Directed--->Self-



Bandura (1977; 1986) found that by observing an expert model performing, people can induce rules or strategies that can greatly improve their effectiveness. These learners will be motivated to imitate the model if they see positive vicarious consequences ensue.

In the second phase, called strategy imitation, the learner tries to imitate the strategy under the help and guidance of the model or teacher. As Zimmerman and Bonner (in press) stated, most features of a learning strategy "require performance experiences in order for the strategy to be fully incorporated into their behavioral repertoire". Observers rehearse a behavior following modeling to improve the approximation of the observer's performance to that of the model. Feedback is recommended throughout the performance enactment to help the observer refine the component parts of his or her imitative behavior. For example, as the basketball player rehearses the inverted wrist strategy, the model or coach may give feedback about various aspects of performance to increase accuracy of performance.

During the third phase, self-control of strategy, the learner uses the strategy apart from the model. According to Zimmerman and Bonner (in press) the use of a learning strategy becomes internalized during this phase, but it still remains dependent on the covert representation of an external model's standard. The learner's focus during this

phase is on process goals, that is, goals involving techniques and strategies to learn a particular task, such as the wrist position before and after release of a basketball throw. Product goals or goals involving outcomes of the movement, are not important in this phase.

During the last phase, self-regulation of strategy, the student performs the movement with little conscious attention to strategies because they have become automatized. The learner's focus now shifts from process goals to outcome goals and he or she no longer depends on the representation of the model's standard. The motivation for continuing the use of the strategy depends now on its effectiveness in achieving the desired outcome.

Zimmerman's model differs from Singer's model in its emphasis on the importance of conscious strategic processes and the essential role of behavioral self-monitoring and self-evaluation. This metacognitive approach instead seeks to increase the strategic and self-evaluative processes during self-regulated learning, not diminish them.

### Conclusion

This dissertation will compare Singer's and Zimmerman's contrasting views of self-regulated learning of motor behavior, especially the role of strategic awareness, self-monitored feedback and self-evaluative processes. Next, I will summarize prior research on these issues.

## CHAPTER 2

### LITERATURE REVIEW

#### Impact of Self-Regulatory Processes on Motor Performance

The purpose of this chapter is three-fold: (1) to review and critically analyze research conducted on four associated self-regulatory subprocesses: strategy use, goal-setting, self-monitoring and self-evaluation, hypothesized to effect acquisition of motor skill, (2) to examine and address the role of self-efficacy and attribution theories in sports performance and (3) to review research, discuss and compare Singer's (1988) and Zimmerman's (1995a) models of self-regulated learning in motor learning that have incorporated these self-regulatory subfunctions.

#### Strategy Use

Within the social cognitive learning theory, strategy use or strategic learning is viewed as a cyclic, self-regulatory process that enables learners to increase their personal control over their own behavioral functioning and immediate environment (Zimmerman, 1989; Zimmerman & Bonner, in press). As a cyclic and a self-regulatory process, strategy use depends on personal, behavioral and environmental influences. Personal subprocesses include students' knowledge, metacognitive processes, goals, and

affect. Behavioral subprocesses are those of self-observation (monitoring one's performance), self-judgement (comparing the performance with pre-set goals), and self-reactions (changes in behaviors resulting from self-judgements). Environmental processes include modeling, verbal persuasion, and the structure of the learning context, such as a task. These triadic influences interact in a reciprocal way, and students achieve greater control of their own learning process if they self-regulate all triadic influences. In addition, social cognitive researchers see strategic learning and motivation as interdependent processes and the two are linked to underlying perceptions of self-efficacy. Self-efficacy refers to a person's confidence that he or she can perform a task under given circumstances (Zimmerman, 1995b; Schunk, 1989).

Academic researchers have identified numerous strategies that optimize learning and achievement, such as reading and memory strategies (Pressley & Wiloshyn, 1995). In contrast, there is little research on motor learning strategies, however, many researchers, coaches and elite athletes strongly recommend their use. For example, Crews (1993) discussed the importance of strategies in motor learning and divided them into three levels: behavioral, cognitive/affective, and psychophysiological. According to this distinction, behavioral self-regulated strategies include contrasts, planning routines, self-monitoring, and

self-reinforcement. Cognitive or affective strategies may include goal-setting self-focused attention, self-talk, imagery techniques and the use of planned mental routines. Finally, psychophysiological self-regulated strategies include the use of biofeedback.

The few studies that have been conducted on motor learning using strategies, such as positive self-talk (Wilkes & Summers, 1984; Mahoney & Avenier, 1977; Mahoney et al., 1987; Gould et al., 1989; Whelan et al., 1991); imagery, relaxation, and attributional training (Feltz & Riessinger, 1990); planning (Kirschenbaum, 1984); process goals which highlight strategy use (Zimmerman & Kitsantas, 1996; 1995) have generally indicated that these strategies improve motor performance.

Although, there has been little empirical data on strategy use in the motoric research, there have been numerous investigations of this topic with academic learning tasks. Zimmerman and Martinez-Pons (1986) identified 14 academic learning strategies. These include personal strategies such as organizing and transforming information, goal-setting and planing, rehearsing and memorizing, and monitoring and evaluating; behavioral strategies, such as keeping records; and finally, environmental strategies such as environmental structuring, seeking social assistance and reviewing records.

Zimmerman (1989) points out that the purpose of these

strategies is to improve student's personal, behavioral and environmental self-regulation. Research using various academic tasks has shown these strategies help students design systematic plans to improve performance, attend to tasks, focus on important features, organize material, enhance self-efficacy beliefs and motivation, keep a productive psychological climate for learning and enable students to have greater control over their learning by believing they are acquiring a successful strategy (Weinstein & Mayer, 1986; Zimmerman, 1985; 1990; Schunk, 1989).

But how does strategic learning become internalized? Four developmental phases have been identified in the internalization of strategic learning. These include: strategy observation, imitation, self-control and self-regulation (see Zimmerman & Bonner, in press). Briefly, Zimmerman and Bonner (in press) suggest that the initial source of one's use of a learning strategy is usually external, but its continued use depends on self-influences. That is, initially, strategies are acquired through expert support in the form of modeling, encouragement and guidance (Bandura, 1986). However, as strategies become more internalized and automatized, people can initiate use of strategies independently.

#### Goal-Setting

Goals refer to intentions to attain a specific standard

of proficiency, usually within a specified time limit (Locke, Shaw, Saari, & Latham, 1981; Locke, 1990; 1991). Goal-setting influences behavioral functioning by focusing attention and regulating one's expenditure of effort (Locke, & Latham, 1985). It is an important process affecting self-efficacy, motivation and performance. Research studies on goal-setting in the acquisition of motor skills have been focused mainly on: (1) goal properties such as proximity, specificity, difficulty and (2) types of goals set (process compared to product goals).

According to goal-setting theory, difficult goals are expected to be more beneficial than easy goals because the former continue to offer more information about one's capabilities as his or her skill level develops. Proximal (short-term) goals are also expected to enhance performance better than distal (long-term) goals because the former makes it easier to evaluate progress made (Schunk, 1990). In addition, specific goals should enhance performance more than general ones because they help learners focus their effort on key outcomes (Schunk, 1990). Finally, process goals, or goals involving techniques and strategies should be more effective than outcome goals because a process goal highlights an established strategy as a means to improve skills, whereas a product goal relegates the strategy to a lower level of importance (Zimmerman & Bonner, in press; Schunk & Rice, 1991). Specifically, Zimmerman and Bonner,

(in press) theorized that initially people should use performance or process goals to master a motoric skill. Performance goals involve strategies that can help the student learn how to perform a particular task, (e.g., developing a strategy for learning how to serve overhand in volleyball). Once the skill is mastered, learners should shift their attention to outcomes, or product goals. Product goals specify the rate or quantity of work (the number of points earned on serve). Thus, process goals are more effective when learners begin to perform on their own, whereas product goals assist learners later during mastery when they are adapting their skill to dynamic conditions in natural environments.

There is research that supports each of these hypotheses of goal theory. First, a considerable amount of research on the acquisition of sport skills generally suggests that people who set specific, proximal, and difficult but attainable goals may experience a higher sense of self-efficacy for attaining them, expend more effort, and persist longer than those who set general proximal, or easy goals (Locke & Latham, 1990; Locke, 1990; Tubbs, 1986; Williamson, 1995; Weinberg et al., 1993). Also non-athletic research shows that these types of goals allow a greater level of self-regulated strategic learning (Bandura, 1986; Bandura, 1988; Locke & Latham, 1990; 1985; Locke, Shaw, Sari, & Latham, 1981; Locke, 1990).

Secondly, research conducted to examine the effects of process and product goals on motor skill acquisition, although scarce, has provided support for Zimmerman's and Bonner's theory (in press). For example, Zimmerman and Kitsantas (1996) hypothesized that process goals are more effective than product goals in learning a novel motor skill and that self-recording will enhance the performance of the task. Adolescent females were taught to throw darts through the use of a three-step strategy. Subjects were randomly assigned to one of the four experimental conditions or a no-practice control group. The experimental conditions were based on the type of self-regulatory treatments--goal function (process or product) and self-recording (present or absent). The results revealed that students with a process goal were more successful in acquiring a novel motor skill than students with a product goal. In addition, self-recording was found to significantly enhance self-efficacy beliefs and development of dart throwing skill.

Other evidence supporting Zimmerman's and Bonner's theory comes from academic settings (Schunk & Swartz, 1993; Schunk & Rice, 1991). For instance, Schunk and Swartz (1993) using fifth grade students examined the hypothesis that providing students with a process goal would increase strategy use more than providing them with a product goal. The task employed was a writing assignment. Results revealed that children who received the process goal treatment showed

superior performance and scored higher than children given product goal or told to "do your best" condition.

It can then be concluded that goal-setting research in sport as well as in academic settings strongly suggests that setting goals can improve performance, and raise self-efficacy perceptions. Particularly, setting process versus outcome, specific versus general, challenging versus easy and proximal versus distal goals seems to be the first step on the road to excellence in sports and in academic areas.

#### Self-Monitoring

Self-monitoring, defined as an individual's deliberate attention to some aspect of behavior (Schunk, 1983) often involves keeping records or logs of one's performance in order to gain some information about the quality of that performance. Its primary purpose is to facilitate some type of behavioral change through self-observation and self-judgments. Effective self-regulation depends on the persistence, informativeness, and immediacy of self-monitoring.

Self-monitoring research in exercise and sports is still in its embryonic stages. The few studies conducted to examine the effects of self-monitoring on motor performance do suggest that self-monitoring is an effective tool in promoting motor skill acquisition (King et al., 1988; McKenzie & Rushall 1974; Kirshenbaum, Ordman, Tomarken & Holtzbauer, 1982). For example, King et al. (1988)

examined the positive impact of self-monitoring on exercise maintenance. Subjects in this study were men and women involved in the second 6-month phase of a 12-month home-based exercise program. Individuals in this trial were randomly assigned to either a self-monitoring or a control group. Those subjects who monitored on a weekly basis, the frequency, intensity, and duration of their exercise as well as perceived enjoyment reported engaging in more exercise sessions per month than did controls.

In another study, McKenzie and Rushall (1974) asked eight members of a swimming team to record their numbers of laps on a program board that was presented publicly. The swimmers checked off the appropriate box when a certain level of output was reached. The results revealed that the students who used self-monitoring performed more laps than the students who did not, which means maintenance of higher motivation to exercise.

In spite of the limited research conducted on the effects of self-monitoring on athletic performance, coaches of elite athletes suggest that self-monitoring is a very important tool in enhancing performance. Keeping a sports journal is one way to increase awareness of performance states and understanding regarding how different situations bring about different results (Ferrari, Pinard, Reid & Bouffard-Bouchard, 1991).

More extensive research from non-athletic settings

indicates that self-monitoring is an essential tool in the self-regulation of learning strategies (Schunk, 1983; Zimmerman & Paulsen 1995). Zimmerman and Paulsen (1995) suggest that self-monitoring affects not only academic achievement but an individual's motivation as well. Self-monitoring can be used to increase students' accuracy by replacing poor learning strategies with more effective strategies. For example, if self-monitoring reveals unexpected outcomes, it is likely that the learner will redirect his/her attention to the details of the strategy execution, make necessary adjustments, or replace his/her ineffective strategies with better strategies (Zimmerman & Bonner, in press). When this occurs, it can lead to higher perceptions of self-efficacy and greater motivation for continued learning (Zimmerman & Paulsen, 1994). Further, Bandura and Schunk (1981) and Zimmerman (1989) have also suggested that self-monitoring directs children's attention to their work and allows them to observe the amount of progress they are making toward their goals.

### Self-Evaluation

Although self-evaluation has been identified as one of the most important components of learning a motoric skill, very little research has been conducted to date. Generally, researchers suggest knowing that you are doing well contributes to doing better. To track improvement and to discover what you need to emphasize in practice, it is

necessary to evaluate performance. According to Zimmerman (1989 pp. 334) self-evaluation "refers to students' responses that involve systematically comparing their performance with a standard or goal". This depends on personal processes such as goal-setting, perceptions of self-efficacy, standards etc.

There are two categories or measurements of athletic self-evaluation. The first category pertains to the movement or the process of moving (e.g., in competitive gymnastics, diving and figure skating quality of performance and movement execution is precisely measured). The second category refers to the result or outcome of movement (e.g., accuracy, distance, speed, time, height, and weight).

Although no research has been conducted to date to determine the effects of these forms of evaluation on students' motor performance, it has been theorized that these evaluative processes are essential if goals are to enhance performance (Locke et al., 1981). Further, sport psychologists have suggested that these evaluative procedures can strengthen behavior, improve performance and also maintain and even increase intrinsic motivation (Schmidt, 1988). In contrast, in non-athletic settings, it has been empirically tested and shown that students given such self-evaluation techniques as checking and rating, displayed greater levels of self-efficacy and their overall performance was significantly improved (Zimmerman, 1989).

### Self-Efficacy and Self-Regulation

Self-efficacy is one of the most important psychological factors thought to affect motor learning and sport performance. According to social cognitive theory (Bandura, 1977; 1986; 1993), self-efficacy is a common cognitive mechanism for mediating people's motivation, decision making and behavior. Self-efficacy is defined as an individual's belief that he or she can successfully execute the behavior required to produce a certain outcome. It is not concerned with the skills an individual possesses but rather with judgements regarding what an individual can do with those skills. It affects the choice of activities, the amount of effort expected, the extent of persistence, and finally, the level of achievement.

Bandura (1977) hypothesized that information about one's personal efficacy expectations can be modified through four major sources of information. These include (1) mastery experiences, (2) physiological states (3) verbal persuasion and (4) vicarious experiences. These now will be examined in more detail.

Past performance or mastery accomplishments which provide efficacy information through one's own repeated mastery experiences are the most dependable and influential sources of efficacy information (Bandura, 1986). For instance, a volleyball player with a history of previous successes in sport will have higher efficacy expectations,

whereas previous failures will result in lowered perceptions of personal capabilities.

Research on weight lifters, divers, and tennis players has consistently confirmed that past performance is the most powerful source of information for enhancing self-efficacy beliefs and performance in athletes (Brody, Hartfield, & Spalding, 1988; Weinberg, Sinardi, & Jackson, 1982; Fitzsimmons et al., 1991). Fitzsimmons et. al. (1991) pointed out that athletes' reliance on their own past performance should not be surprising for, as Bandura (1977) emphasized, performance of others may not be relevant if they differ physically, or experientially.

Vicarious experiences are sources of efficacy information acquired through observing or imagining the others engaging in the task to be performed. The modeling effects, although generally weaker than the mastery experiences, have constituted a dependable source of efficacy information across a variety of domains like academic learning (Zimmerman & Ringle, 1981; Schunk, 1991) and motor learning (George, Feltz & Chase, 1992; McAuley, 1985). The effectiveness of modeling on people's beliefs regarding their own ability to execute a certain level of performance depends on a number of variables (Bandura, 1977).

A first variable is model similarity. Research on the latter has shown that efficacy expectations will be raised

if one views the model as similar to oneself and as performing successfully (Schunk & Hanson, 1985; Gould & Weiss, 1981; McCullagh, 1987; Lirgg & Feltz, 1991). For example, Gould and Weiss (1981) demonstrated that a model, who was similar to observers in gender and physical ability and who made positive efficacy statements, enhanced the observers' efficacy beliefs, endurance and performance more than a dissimilar model.

Similar conclusions were drawn by McCullagh (1987) from research on novice college women who were videotaped while performing a balance task. The subjects in a similar condition were told that the model was a college student who had no previous experience. Dissimilar-condition subjects were informed that the model had experience with balance tasks. It was found that subjects performed better after watching a model whom they perceived to be similar than those who perceived as dissimilar.

Other modeling variables that may influence self-efficacy and performance are model competence and model status. The few studies that have been conducted to test model competence or perceived ability show that a model perceived to be competent to observers, enhanced observer's efficacy beliefs and performance over a less competent model (Weinberg et al., 1979; Lirgg & Feltz, 1991). For instance, Lirgg and Feltz (1991) examined the influence of skilled, unskilled teacher and peer models on motor performance.

Sixth grade females (N=100) were randomly assigned to five groups: (a) skilled teacher model, (b) skilled peer model, (c) unskilled teacher model, (d) unskilled peer model, or (e) no model. The independent variables of the study were model type (teacher vs peer) and model ability (skilled vs unskilled). The Bachman Ladder was used as the task-tool. Results revealed that subjects decreased their efficacy judgements to a greater extent when they observed a model whom they perceived to be competent but who performed in an unskilled manner, compared to subjects who observed the model performed skillfully. The effect of model status on efficacy beliefs in the motor performance area has not been examined.

Social persuasion is a technique commonly employed by teachers, coaches and peers to enhance individuals' personal efficacy. The extent of persuasive influence on self-efficacy depends on the credibility, prestige, trustworthiness, and expertise of the persuader (Gould et al., 1989). The few studies that have used persuasive techniques, such as positive self-talk (Mahoney, 1979; Wilkes & Summers, 1984; Gould et al., 1989), imagery (Feltz & Riessinger, 1990) and performance deception (Fitsimmons et al., 1991), as the main source of efficacy information have reported that, these cognitive strategies can enhance self-efficacy and improve motor performance.

First, Mahoney (1979) stated that self-talk is a useful

method for building up the self-efficacy expectations of athletes. Further, Wilkes and Summers (1984) were able in their study to demonstrate a mediational effect of efficacy beliefs and self-talk as a form of verbal persuasion and performance. More recently, Gould and colleagues (1989) who conducted a study to assess strategies intercollegiate wrestling and national team coaches use to enhance self-efficacy, found that these coaches rated positive self-encouragement as the third most effective strategy for developing self-efficacy, after having ranked physical practice first and the modeling of confidence by the coach himself/herself second. It may be concluded then that these studies strongly indicate how effective positive self-talk is for enhancing self-efficacy perceptions.

As far as the role of imagery as a persuasive technique is concerned it has generally been shown that imagery is an effective tool in enhancing motor performance. For example, Feltz and Reissinger (1990) conducted an experiment to investigate the effects of in vivo emotive imagery and performance feedback in enhancing self-efficacy beliefs and performance on a competitive muscular endurance task. The subjects (60 males and 60 females) were randomly assigned to three treatment groups: (1) a mastery plus feedback group (2) a feedback alone group and (3) a control group. It was hypothesized that subjects who were given emotive imagery in vivo, plus performance feedback would have higher efficacy

expectations and longer performance than subjects in the performance feedback or control group. Imagery exposure involved looking at a five-minute audiotapes recording of either a mastery or relaxation producing image and then mentally practicing the technique without the tape for two trials. It was found that subjects who were given imagery exposure had higher and stronger efficacy expectations during performance and had longer performance than the feedback-only and the control group.

In an alternative fashion, Fitzsimmons et al. (1991) conducted a study to examine the impact of performance deception on self-efficacy beliefs. They used as subjects 36 male undergraduate volunteers involved in a weight training program and being experienced in one repetition maximum (1RM) performance sessions. The subjects were labeled experienced rather than expert weight lifters. They were randomly assigned to one of three treatment groups: (1) accurate performance information, (2) false information that they lifted more than their actual lift and (3) false information that they lifted less than their actual lift. Results showed that false positive feedback increased self-efficacy judgments and future weight-lifting performance.

Affective states are postulated to influence behavior through the cognitive evaluation (efficacy expectations) of the information conveyed by the arousal. How increased arousal is interpreted will affect one's self-efficacy to

carry out a course of action successfully (Bandura, 1986). For example, perceiving increased respiration rate as physiological stress rather than psychological readiness can decrease personal efficacy.

To my knowledge, the few existing studies that have investigated the effectiveness of emotional arousal as a facilitator of self-efficacy, have been rather unconvincing. Karanagh and Hausfeld (1986) attempted to determine whether negative or positive mood states influence self-efficacy for the performance of a physical task. Although mood changes and self-efficacy were related, no clear picture has emerged as to the mediational role that efficacy beliefs are theorized to play between arousal and performance.

Based on the studies reviewed above, it has been well established that the various sources of information proposed by Bandura (1977) can influence self-efficacy perceptions. But what of the subsequent effect of self-efficacy on performance? For the most part, studies of the efficacy-motor performance relationship have not been designed to determine the causal links between them. However, Feltz (1988) has employed path analyses to determine the strength of some of the causal relationships suggested by Bandura (1977; 1986). Although the mechanisms are not completely clear in terms of the effects on performance of variables other than self-efficacy, it appears from these studies that self-efficacy is an important determining factor of motoric

performance.

Studies that have been conducted specifically to investigate the relationship between self-efficacy and performance with participants in actual sports situations, have shown that the higher the perceived self-efficacy, the better the sport performance (Feltz, Bandura, & Lirgg, 1989; Weiss, Wiese, & Klint, 1989; Feltz & Riessinger, 1990; Miller, 1993; Gould et al., 1983; Barling & Abel, 1983; Bernier & Avard, 1986). For instance, Gould et al. (1983) studied the competitive anxiety patterns of 13 to 19 year old boys participating in a national wrestling tournament. Findings show that young wrestlers who were tournament placers, reported higher perceptions of ability, predictions of performance success, and confidence in their predictions than did non-placers.

Additional evidence for the strong role that self-efficacy plays in sport performance is provided by Weiss and her colleagues (1989). They conducted a study using 22 boys ranging in age from 7 to 18 years who were members of a competitive youth gymnastics club participating in state gymnastics tournament. Gymnastic self-efficacy was assessed by having gymnasts record the scores they thought they were capable of performing about 2 hours before the start of competition at the state championships. They found that the correlation between self-efficacy and performance was  $r = .57$  for young gymnasts competing in a state gymnastics

tournament. Gymnasts who predicted higher levels of performance success, demonstrated higher self-efficacy and performance levels.

Finally, the powerful role that self-efficacy plays in sport performance is also demonstrated in a study conducted by McAuley and Gill (1983). Correlations between self-efficacy and gymnastic performance in college-age subjects were found to range from  $r = .28$  on the vault to a high of  $r = .72$  on the uneven bars.

A number of recent studies have also suggested that links do exist between self-efficacy and physical activity or exercise. Sallis and his colleagues (1986) reported that efficacy beliefs predicted changes in the intensity levels of activity within a community sample of elderly adults. In an analogous fashion, McAuley and Jacobson (1991) were able to demonstrate, in a sample of sedentary adult women, a modest relationship between self-efficacy and program attendance, as well as regularity and duration of exercise at follow up.

However, some studies have found that self-efficacy is consistently an important predictor of initial performance, but after the first performance trial, past performance becomes a better predictor of future performance (Feltz, 1982; Fitzsimmons et al., 1991). Feltz (1982), in a study using back diving as a task found that self-efficacy became weaker as a predictor of performance from Trial 1 to Trial

4. Similarly, Fitzsimmons et al. (1991) in a study conducted to investigate whether self-efficacy or past performance is the major predictor of future performance found that for subjects with greater experience, past performance accounts for nearly all the variance in future performance. Bandura (1986) has noted that peak performance is a confounded index that includes self-efficacy perceptions as well as prior performance, and that this research design can be challenged. Thus, self-efficacy can add little to the variance not already accounted for by past performance.

#### Attribution Theory and Motor Performance

The reasons employed to explain and understand achievement outcomes are commonly referred to us as causal attributions. It has been shown that attributions affect students' motivation, self-efficacy, achievement, goals and emotions (Schunk, 1989). Attributions influence self-regulation when students compare their goals with their progress and evaluate their performance.

In his original attributional model, Weiner (1972) identifies ability, effort, task difficulty and luck as the four causal attributions most commonly ascribed to achievement outcomes. Central to Weiner's (1986) reformulated theoretical model is the supposition that specific causal attributions by themselves are largely unimportant, but types of attributions are very influential.

He classifies attributions in four major categories: locus of causality, stability and controllability dimensions. The locus of causality refers to whether the cause of the performance or achievement outcome is perceived to reside within, or is external to, the attributer; the stability dimension concerns the relative validity of the cause overtime; and the control dimension determined whether the cause is deemed to be under the control of the attributer or other people.

Other researchers however, argue that there are numerous other ascriptions in which causality might be inferred. This is particularly true in the case of such domains as sports and physical activity where deliberate practice, and effective use of strategies are commonly mentioned. According to Zimmerman and Martinez-Pons (1992) "strategy attributions are a vital self-judgmental process linking strategy monitoring and use". Although the investigation of student's strategy attributions is non-existent in sport psychology, quite the opposite is true in the field of academic functioning. It has been shown that students who attribute failure to ineffective use of strategies report higher levels of self-efficacy and remain motivated to work efficiently. Conversely, students who attribute failure to ability, effort, or even worse to luck hold low levels of self-efficacy and they hold beliefs such as they cannot succeed on their own (Schunk, 1989).

For example, Anderson and Jennings (1980) compared the motivational effects of strategy attributions with ability attributions. Subjects in the first treatment group were taught to attribute failure to ineffective strategies whereas the other group attributed failure to their ability. Results revealed that subjects in the first treatment group demonstrated higher expectations for success, monitor the effectiveness of their strategies used and adjusted them more frequently than subjects in the second group who believed that could not improved their performance.

Similarly, Clifford (1986) compared the motivational effects of strategy attribution with attributions to effort which is a controllable factor. She hypothesized and confirmed that strategy attributions maintained students' motivation when failure or negative results occurred, better than did effort attributions.

It may be concluded then, that research conducted in academic settings does provide evidence that attributions to strategy use enhance students' motivation, self-efficacy, achievement and goals more than do attributions to ability, and effort.

#### Singer's and Zimmerman's Models of Self-regulated Learning

Singer's (1988) Five-Step Model of Self-Regulated Learning is one of the most comprehensive models of self-regulated learning in motor skills (see Figure 1). This well known model incorporated five steps: (1) performers are

instructed to relax and try to get ready to perform the task, (2) use an imaginal strategy such as imagine the perfect model, (3) focus exclusively on a fixed cue, (4) execute the task and (5) evaluate if time permits. The model seeks to induce automatized performances by freeing oneself from self-directed thoughts. These procedures all seek to reduce self-awareness which is theorized to impede performance.

Research conducted using Singer's model indicates that this model is beneficial to learning both in a laboratory and a in applied setting (Singer et al., 1989; Singer et al., 1993). Specifically, Singer et al., (1993) tested the effectiveness of three learning strategies using three treatment groups: (1) an awareness strategy (where subjects were instructed to be aware while performing the task) (2) a non-awareness strategy (subjects in this group were instructed to perform the task without any conscious attention and (3) the Five-Step Approach strategy (where subjects were told to get ready, imagine the act, focus their attention on a fixed cue, execute, and evaluate). Seventy two subjects were randomly placed in these three treatment groups. The task used was a computer-managed ball-throwing task. Results indicated the greater effectiveness of the Five-Step Approach in acquiring motor skills and the non-awareness groups than the awareness group. Subjects in the Five-Step Approach showed numerically not statistically

greater scores than the non-awareness group.

An alternative model of self-regulated learning was recently proposed by Zimmerman (1995a). This model, known as the Dynamic Feedback Model of Self-Regulated Learning (see Figure 1), views motor learning as a cyclic process that involves strategy use, goal-setting, self-monitoring and self-evaluation. According to this model, learners set goals and use selected strategies to achieve these goals, self-monitor, evaluate their performance and analyze key processes via a cyclic feedback loop.

In comparing Singer's (1988) self-regulated model with that of Zimmerman's (1995a) self-regulated learning model, both theorists incorporate similar subfunctions of self-regulation. However, they disagree on which type of strategy, goals, monitoring, and evaluation is optimal.

The first major difference between the two models relies on strategy use. In Singer's model (1988) learners are asked to imagine the perfect model performing the task. In contrast to this encompassing idealistic imagery, Zimmerman (1995a) suggests that learners should be selective and imagine only the part of a skill that they missed during the previous performance.

The second major difference concerns the goals. Although both theorists agree that goals should be specific and proximal, they differ in respect as to what type should be selected: process or outcome goals. Singer states that

learners should focus on the outcome rather than on the process, perform without conscious thought, and most importantly, devote no attention to the movement pattern. In contrast, Zimmerman suggests that novices should focus their attention on process goals, until the necessary steps are mastered and then their attention should be shifted toward the outcomes of these processes. For instance, a volleyball player's attention initially should be geared toward mastering the steps of the overhead serve. Once this is mastered then attention should be shifted to the quality of the overhead serve, a "down the line" serve or to a crosscourt or "kill" serve, rather than on the movement itself. There is evidence that supports this goal sequence (Zimmerman & Bonner, in press; Zimmerman & Kitsantas, 1996).

Finally, another major difference between the two models is the self-evaluation process. According to Zimmerman's model, self-evaluation is one of the most important parts of self-regulation. The importance of self-evaluation, which involves the comparison between the individual's own performance and his or her goal, has been shown in numerous studies of academic learning (Bandura, 1986; Zimmerman, 1986). Singer's model (1988) contends that learners should evaluate their performance only if "time permits", and thus self-monitoring procedures and evaluation play a marginal role in learning. Zimmerman's model however, emphasizes a "self-oriented feedback" loop that,

incorporates a cyclic process in which athletes may monitor the effectiveness of the learning strategies being in use (Zimmerman, 1990). According to this view, self-regulated students select and use self-regulated learning strategies to achieve desired outcomes on the basis of specific feedback about learning effectiveness and skill. This feedback loop allows students to compare their performance on tasks with their predetermined goals and standards. If a learner compares his or her performance to the standard and finds that it is discrepant, he or she can then self-correct.

#### Purpose of the Study

The purpose of this study is to compare Singer's (1988) and Zimmerman's (1995a) models on the basis of three common dimensions: strategy use, goal setting and self-evaluation. Both theories assume that these self-regulatory subfunctions play a critical role in acquisition of motor skills, although they differ on which type of strategy, goals, monitoring, and evaluation is optimal. It is hypothesized that Zimmerman's dynamic model of self-regulated learning which involves an analytic strategy, a dynamic cue, and self-evaluative processes will improve learning more than Singer's (1988) model which involves an imaginal strategy, a fixed goal, and the absence of self-evaluation.

Pilot study data has revealed that Zimmerman's (1995a) model of self-regulated learning improved dart-skill,

increased self-efficacy and intrinsic interest of the task more than Singer's (1988) model. In addition, students who used strategies and self-evaluated their progress attributed their failures to incorrect use of strategy (Zimmerman's model) rather than to their ability (Singer's model). Therefore, it is expected that Zimmerman's model will be more effective in acquiring and mastering motor skills.

### Hypotheses

H1: Students given analytic strategy will surpass those given imaginal strategy on dart-skill, self-efficacy, intrinsic interest, and strategy attributions.

H2: Students given dynamic cues, will surpass those given a fixed cue on dart-skill, self-efficacy, intrinsic interest, and strategy attributions.

H3: Students who self-evaluate will surpass those who do not on dart-skill, self-efficacy, intrinsic interest, and strategy attributions.

H4: Students who use an analytic strategy, dynamic cue, and self-evaluate will surpass those given a imaginal strategy, a fixed cue, and don't evaluate on dart-skill, self-efficacy, intrinsic interest, and strategy attributions.

H5: Students who use a imaginal strategy, a fixed cue, and don't evaluate will show significant differences on dart-skill, self-efficacy, intrinsic interest scores, and strategy attributions, than the control group.

### Summary

Self-regulation is a very important tool in learning a motoric skill. Self-regulation operates through a set of self-regulatory subfunctions: strategy use, goal-setting, self-monitoring, and self-evaluation. It has been shown that these four self-regulatory subfunctions influence performance in numerous ways. Briefly, strategy use helps the learner to focus on important features of the task, raises self-efficacy, which in turn enhances motivation for self-regulation, goal-setting regulates his/her expenditure of effort, self-monitoring facilitates the desired behavioral change, and self-evaluation systematically enhances the comparison of his/her performance with a goal or standard (Zimmerman, 1986; 1989; 1990; 1994; 1995a; 1995b; Schunk, 1989).

Given the importance of self-regulation, researchers have developed and empirically tested a number of self-regulated learning models both in academic and motor learning settings (Zimmerman, 1990; Kirschenbaum, 1984). Two recent models that strongly support that self-regulated learning plays a critical role in the acquisition of motor skills are: Singer's (1988) Five-Step Model of Self-Regulated Learning and Zimmerman's (1995a) Dynamic Feedback Model of Self-Regulated Learning. In this study these two self-regulated models that have been shown to play a key role in the acquisition of motor skills will be tested for

their effectiveness in acquiring motor skills. It is expected that Zimmerman's Dynamic Feedback Model of Self-Regulation will be the most effective self-regulation model to help students develop self-regulatory skills to cope with various forms of obstacles throughout the entire process of motor skill acquisition, reach their fullest potential and achieve peak performance.

## CHAPTER 3

### Methods

#### Sample

Ninety girls from four ninth and tenth grade physical education classes of a parochial all-girls school participated in this study. This female population was selected because very few of these young women had previous experience with the selected task, dart throwing. They ranged in age from 14-16 years ( $M = 15.16$ ). These subjects came from predominantly middle class families. Over 50% of their parents were college educated. Their ethnic composition were diverse: There were 28.9% Americans of European extraction, 21.1% African-Americans, 30% Hispanic-Americans, and 20% Asian-Americans. All subjects received a certificate and a commemorative pin for their participation in the experiment.

#### Task materials

A dart throwing game was used which included a wooden framed target board and six steel-headed, plastic-feathered darts. The target was made up of 7 regular concentric circles with a "bullseye" having a radius of 1/2 inch, each succeeding circle increasing in radius by one inch. Each zone or circle were assigned a numerical value, beginning with a center value of 7 and successively diminishing in assigned values by one until the outermost

circle has a value of one. The target was positioned with its uppermost edge 5.8 feet high and all darts were thrown from a distance of 8.5 feet from the target. Six darts were given to the subjects to perform the task.

### Measures

Dart-throwing skill. A test was designed to determine the dart throwing skill level of each participant. After receiving instructions in throwing and scoring (see procedure section), the girls were told to "do their best" and were given six darts to throw. Each person's final score represented the average for six throws and thus could range between 0 and 7 points (see Appendix J).

Self-efficacy scale. An individual measure of self-efficacy was developed for use in this study following procedures outlined by Bandura and Schunk (1981). The self-efficacy measure included items regarding the subjects' capability to throw darts. All items were introduced with the phrase "How sure are you that you can score at least..." followed by these phrases: (1)... 7 with one dart (2)... 5 with one dart (3)... 3 with one dart and (4)... 1 with one dart. The subjects responded using an efficacy scale that ranged from 10 to 100 points in 10 unit intervals. Written descriptions are following points of scale: 10 (not sure), 40 (somewhat sure), 70 (pretty sure), 100 (very sure) (see Appendix C). Each girl's score was composed of the average self-efficacy rating for the four items. According to

Gronbach's alpha test the inter-item reliability of the four self-efficacy questions was .89, replicating Zimmerman and Kitsantas (1996) reliability coefficient of .89.

Self-reactions scale. The girls' satisfaction with their dart throwing proficiency was also assessed with a single item scale that ranged from 0 to 100 in 10 unit intervals. Written labels were offered for the following points: 10 (not satisfied) 40 (somewhat satisfied), 70 (pretty satisfied) and 100 (very satisfied). Each participant's score indicated how satisfied she was about her overall performance (see Appendix D).

Intrinsic interest scale. The young women were also asked to rank their preference for the dart throwing in comparison with four other sports, namely volleyball, soccer, tumbling, and apparatus gymnastics. The other sports were selected from a list of those that had been studied as part of the regular physical education and thus they were familiar to all of the girls without having been self-selected. The rank of 1 represented the most favored sport ranging to 5 for their least favored sport. Each girl's score was determined by her ranking of dart throwing (see Appendix E).

Attribution scale. Finally, the young women in all treatment groups, including the control group were asked to answer the following questions after 3 minutes of practice: "Why do you think you missed the bull's eye at the last

trial?" and "what can you do to improve your performance". Students' written answers were grouped according to their reasons for failure, whether because of lack of strategy, effort, ability, practice, "I don't know" or "other" (see Appendix F).

#### Design and Procedure

The girls from four physical education classes were asked to participate in a study of dart throwing and all agreed (see Appendices G & H). The 90 subjects were randomly assigned to one of eight experimental conditions and a practice control group, and thus there were 10 girls in each group. The experimental conditions were based on the type of self-regulatory treatments--strategy (analytic or imaginal); focus (fixed or dynamic cue); self-evaluation (present or absent). The conditions were: (a) analytic strategy, focus on a fixed cue and no self-evaluation, (b) analytic strategy, focus on a dynamic cue and no self-evaluation, (c) analytic strategy, fixed cue and self-evaluation, (d) analytic strategy, dynamic cue and self-evaluation, (e) imaginal strategy, focus on a fixed cue and no self-evaluation, (f) imaginal strategy, focus on a dynamic cue and no self-evaluation, (g) imaginal strategy, fixed cue and self-evaluation and h) imaginal strategy, dynamic cue and self-evaluation. The young women were taken into a separate room and were tested individually by the experimenter. The first 10 minutes of the session were devoted to

demonstrating the skill and explaining the scoring system (see Appendix B).

All experimental groups and the control group listened to the following videotaped instructions and watched the demonstration about throwing the darts (see McClintock, 1977; McLeod, 1977). The Grip: Hold the dart between your first and second finger and the thumb. Simply grasp the dart comfortably. The Stance: Stand behind the white throwing line facing the target. Stand comfortably with your feet slightly apart. If you are right-handed, the right foot should be slightly ahead of the left, touching the toe line and pointing toward the board. If you are a left-handed, place the left foot forward. Sighting: Keep your arm close to your body. Using your arm and wrist and with the elbow acting as a fulcrum, bring the dart up and draw it back toward your face it almost brushes your cheek where you find it most comfortable to stop. The Throw: Keep all the other parts of your body still when you throw. Your head must be held steady and you must not jerk the throw. Try to develop a smooth arc-like throw using the wrist and elbow as pivots. Hold your elbow steady and keep it parallel to the floor. Your wrist should be loose and laid slightly back. Use only the lower part of the arm and wrist to throw. The throw need not be hard, but it must be crisp. The dart should get to the board quickly with as little trajectory as possible. Follow Through: After you release the dart, simply allow

your arm to continue in its natural motion. Let your hand, with your fingers fully extended, following the dart as it moves toward the target. Now watch as I demonstrate this method of throwing and form a clear image of how it should be done (see Appendix A).

Experimental subjects were then given 20 minutes to practice dart throwing, and thus the time was equalized for each girl but not the throwing trials. The following operational definition for each type of strategy was adopted. Girls assigned to the analytic strategy, fixed cue and no self-evaluation condition were told to try to analyze the outcome, that is if dart goes right or left of target to correct the verticality of their forearm and if the dart goes high or low, to correct the follow through. But as they aim, focus only on the "bulls eye" and just throw it. Young women in the analytic strategy, dynamic cue and no self-evaluation condition were instructed to try to analyze the outcome, that is, if dart goes right or left of target to correct the verticality of their forearm and if the dart goes high or low, to correct the follow through. But as they aim and throw, focus only on the part of the throwing process that was not properly done in the first trial. Girls assigned to the analytic strategy, fixed cue and self-evaluation condition were told to analyze the outcome, that is if dart goes right or left of target to correct the verticality of their forearm and if the dart goes high or

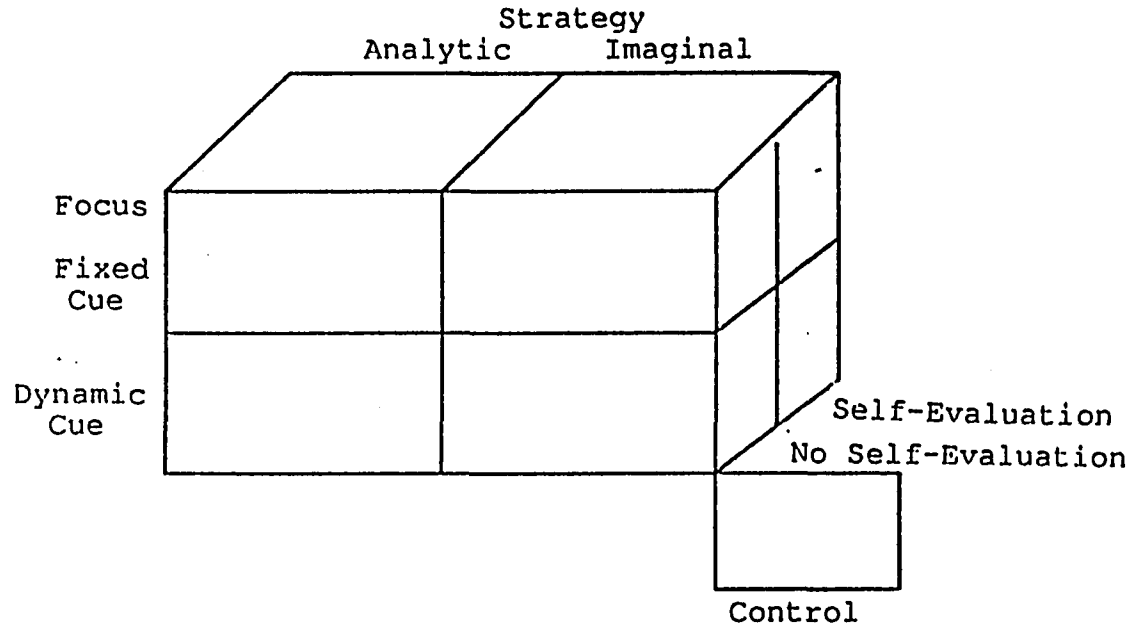
low, to correct the follow through. But as they aim, focus only on the "bulls eye", and write down the step(s) if any, that they missed, based on the interpretation of the outcome and then, again focus on the "bulls eye" and just throw it. The young women in the analytic strategy, dynamic cue and self-evaluation condition were told to analyze the strategy mentioned above. But as they aim and throw, focus only on the part of the throwing process that was not properly done in the first trial, and write down the step(s) if any, that they think that they missed. Girls assigned to the imaginal strategy, fixed cue and no self-evaluation condition were told that in order to do well in dart throwing they should visualize the perfect throw before actually doing it. But when they aim, focus only on the "bulls eye" and just throw it. Girls in the imaginal strategy, dynamic cue and no self-evaluation condition were asked to focus on imaging the perfect throw before actually doing it. But when they aim and throw, focus on the part of the throwing process that was not properly done on the first trial. Girls assigned to the imaginal strategy, fixed cue and self-evaluation condition were instructed to visualize the perfect throw before actually doing it. But when they aim, focus only on the "bulls eye," just throw it and write down the step(s) if any, that they think they missed. In the imaginal strategy, dynamic cue and self-evaluation condition subjects were just told to visualize focus on the perfect throw before actually

doing it. But when they aim and throw it, focus on the part of the throwing process that was not properly done on the first trial, and write down the step(s) if any, that they missed during their execution of the task. The control group was instructed to "do their best". They were given no strategies, cues or evaluation procedures while practicing (see Figure 2).

After practice was completed, all experimental groups, including the control group were post-tested for dart throwing proficiency, self-efficacy, self-reaction, intrinsic interest, and attribution measures. The experimenter began and terminated each section, kept scores for the non-evaluation groups while they were practicing and recorded the posttest scores.

Figure 2

Design of the Study



Treatment Groups

1. Analytic strategy, fixed cue and no self-evaluation
2. Analytic strategy, dynamic cue and no self-evaluation
3. Analytic strategy, fixed cue and self-evaluation
4. Analytic strategy, dynamic cue and self-evaluation
5. Imaginal strategy, fixed cue and no self-evaluation
6. Imaginal strategy, dynamic cue and no self-evaluation
7. Imaginal strategy, fixed cue and self-evaluation
8. Imaginal strategy, dynamic cue and self-evaluation
9. Control

## CHAPTER 4

## Results

The data for each dependent measure were analyzed using a 2 (goal-setting) x 2 (self-evaluation) x 2 (strategy) factorial analysis of variance (ANOVA). A priori comparisons were also conducted between (1) the control group and the imaginal strategy, fixed cue and no self-evaluation group (Singer's model) (2) the control group and the analytic strategy, dynamic cue and self-evaluation group (Zimmerman's model) and (3) the imaginal strategy, fixed cue and no self-evaluation group (Singer's model) and the analytic strategy, dynamic cue and self-evaluation treatment group (Zimmerman's model). Finally, correlational statistics indicating the relationship between the variables and attribution frequencies were also employed.

Factorial Analyses

Table 1 displays the means and standard deviations of all measures for each experimental condition.

For the dart throwing measure of skill, there was a significant main effect for goal-setting,  $F(1, 72) = 14.46$ ,  $p < .01$ , for self-evaluation  $F(1, 72) = 256.72$ ,  $p < .01$  and for strategy  $F(1, 72) = 116.96$ ,  $p < .01$ ; however, no significant interactions between the goal-setting, self-evaluation, and strategy were found. Specifically, girls who were ( $M = 4.61$ ) told to focus their goal on a dynamic cue

Table 1

Dependent Measure Means (and Standard Deviations) for the  
Control and the Experimental Groups

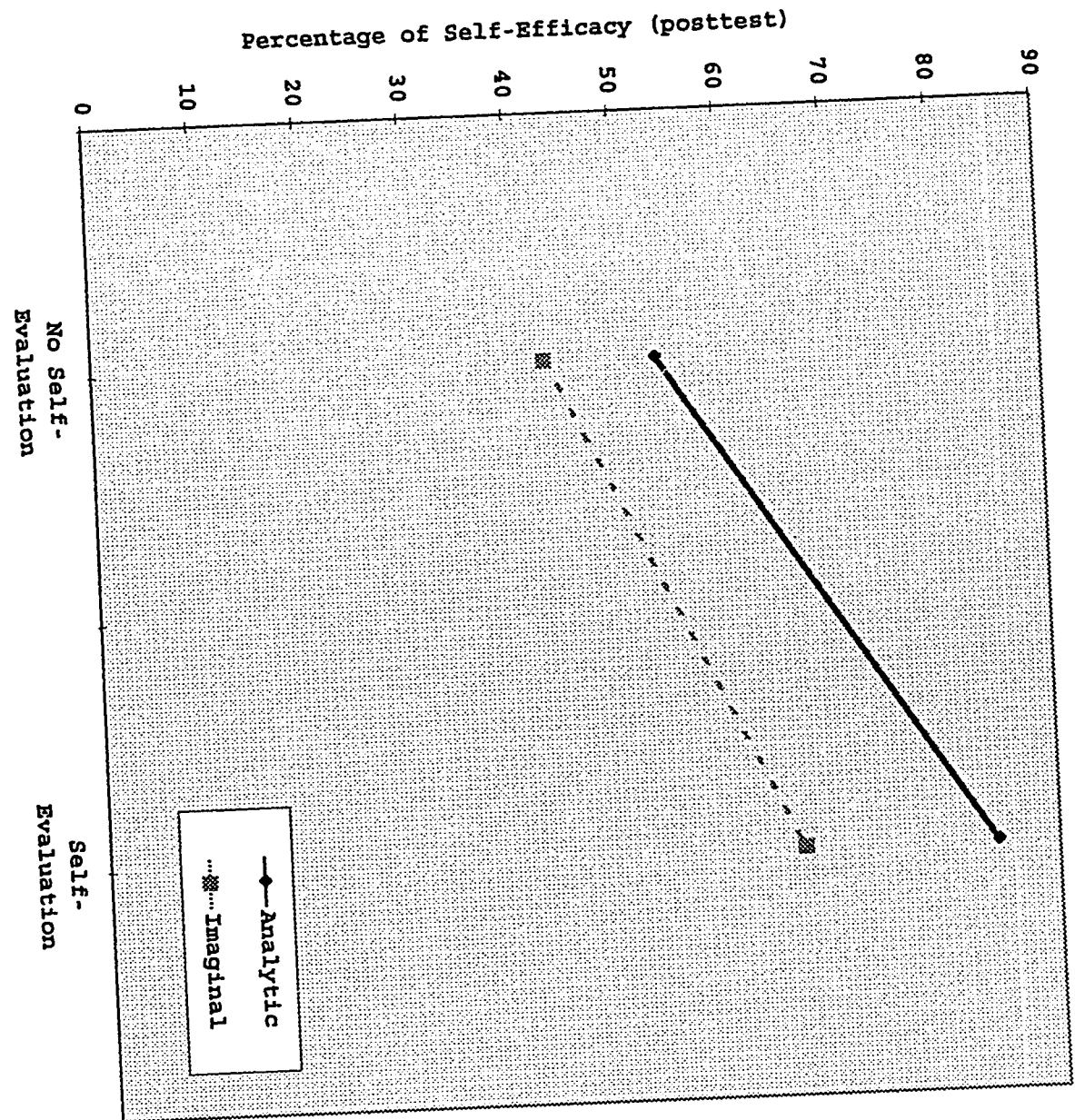
Dependent Measures	Experimental Group				
	Control	<u>Analytic Strategy</u>		<u>Imaginal Strategy</u>	
		Fixed	Dynamic	Fixed	Dynamic
Dart-skill					
Self-Evaluation		5.47 (.35)	6.32 (.25)	4.51 (.51)	4.79 (.62)
No Self-Evaluat.	2.60 (.34)	3.98 (.47)	4.20 (.42)	2.85 (.46)	3.15 (.65)
Self-efficacy					
Self-Evaluation		75.25 (12.93)	93.25 (6.88)	62.00 (6.95)	70.00 (5.53)
No Self-Evaluat.	44.50 (6.32)	50.50 (10.46)	56.75 (8.00)	42.25 (7.68)	43.75 (5.03)
Self-reactions					
Self-Evaluation		78.00 (9.19)	96.00 (5.16)	71.00 (11.97)	71.00 (9.94)
No Self-Evaluat.	41.00 (9.94)	50.00 (12.47)	59.00 (11.01)	47.00 (12.52)	54.00 (18.38)
Intrinsic Interest					
Self-Evaluation		1.90 (.88)	1.30 (.48)	2.10 (.74)	2.20 (.42)
No Self-Evaluat.	4.50 (.71)	3.6 (1.3)	3.90 (.88)	4.10 (.74)	4.00 (.82)

surpassed the dart throwing proficiency of those who were told to focus on a fixed cue ( $M = 4.20$ ). Girls who self-evaluated ( $M = 5.27$ ) attained greater dart skill than those who did not self-evaluate ( $M = 3.54$ ). Lastly, girls instructed to use an analytic strategy ( $M = 4.99$ ) performed better in dart skill than those who were instructed to use an imaginal strategy ( $M = 3.83$ ).

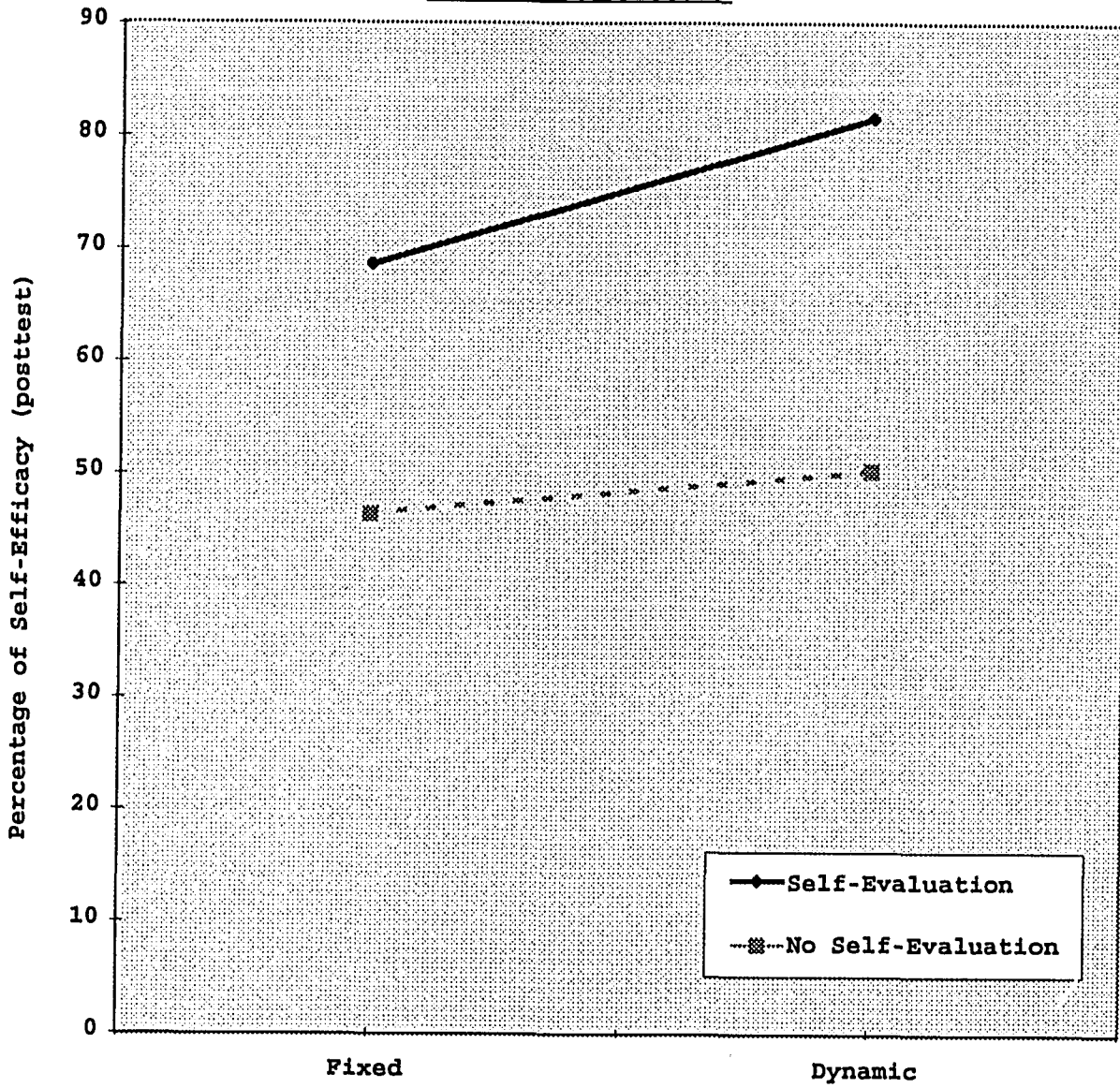
The impact of goal-setting, self-evaluation and strategy treatment components on self-efficacy was also assessed by ANOVA statistical procedures. There was a significant main effect for goal-setting  $F(1, 72) = 20.66, p < .01$ , for self-evaluation  $F(1, 72) = 208.69, p < .01$ , and for strategy  $F(1, 72) = 60.59, p < .01$ . There were also significant interactions between self-evaluation and strategy  $F(1, 72) = 4.22, p < .05$ , and between self-evaluation and goal-setting  $F(1, 72) = 6.043, p < .02$ , (see Figures 3 and 4); however there was no significant interaction between goal-setting and strategy use. Girls ( $M = 65.94$ ) who focused their goal on a dynamic cue were more self-efficacious than those who focused on a fixed cue ( $M = 57.50$ ). Girls ( $M = 75.13$ ) who self-evaluated displayed greater self-efficacy than those who did not self-evaluate ( $M = 48.31$ ). Girls ( $M = 68.94$ ) who adapted an analytic strategy were more self-efficacious than girls who adapted an imaginal strategy ( $M = 54.50$ ). Post hoc Tukey tests revealed that girls who were given the analytic strategy and

Figure 3

Interaction Effect of Self-Evaluation and Strategy Use for Self-Efficacy at Posttest



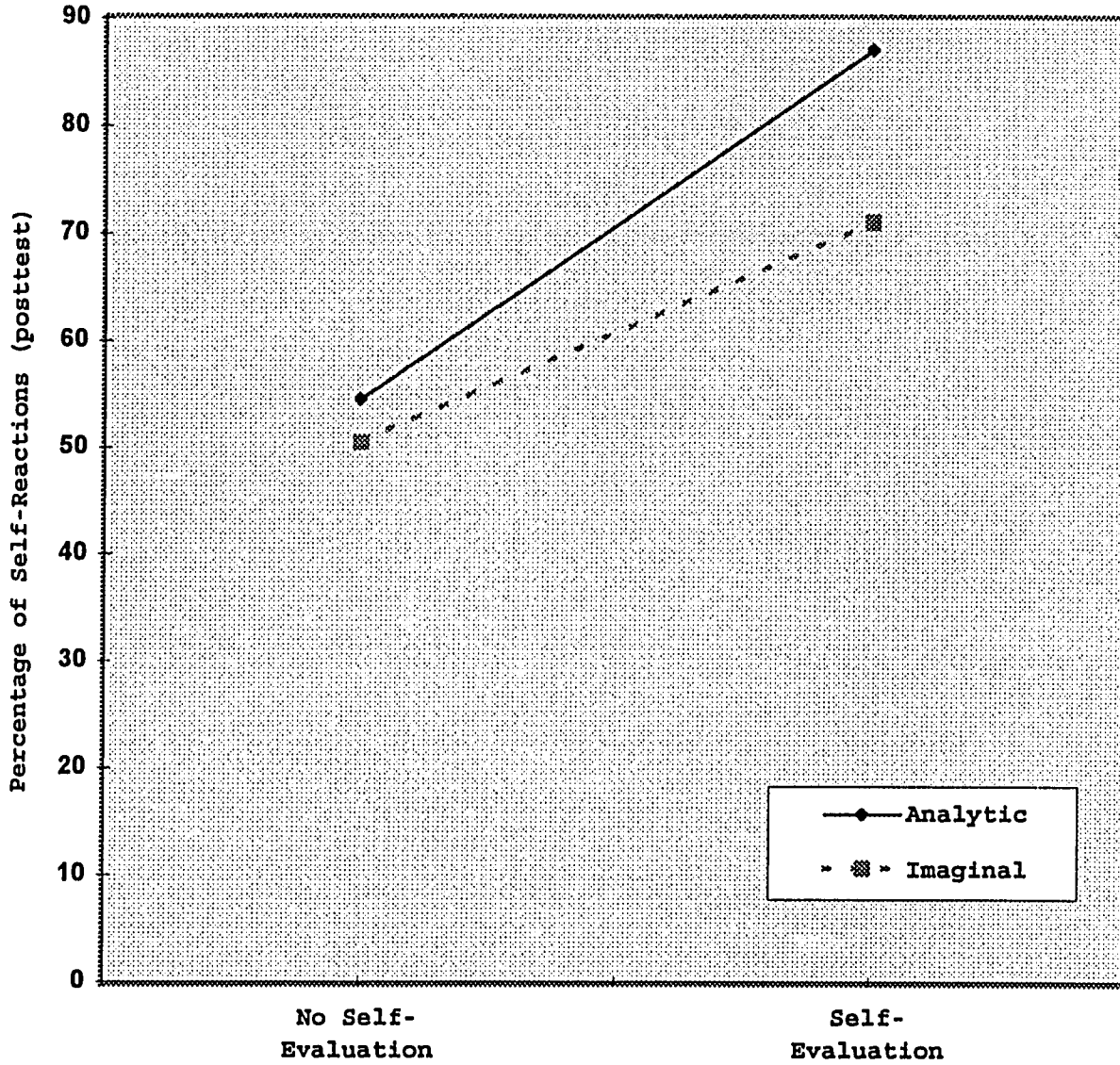
Interaction Effect of Self-Evaluation and Goal Setting for Self-Efficacy at Posttest



self-evaluated ( $M = 84.25$ ) had higher self-efficacy perceptions than girls who did not self-evaluate ( $M = 53.62$ ),  $p < .05$ . It was also found that self-evaluation increased the self-efficacy of students given an imaginal strategy significantly, (from  $M = 43.00$  to  $M = 66.00$ ),  $p < .05$ , but not as much as it did for students given the analytic strategy. In addition, self-evaluation increased the self-efficacy of students given a dynamic goal significantly (from  $M = 68.63$  to  $M = 81.63$ ),  $p < .05$ , but it did not increase the self-efficacy of students given a fixed goal (from  $M = 46.38$  to  $M = 50.25$ ).

The ANOVA for self-reactions yielded similar results: Specifically, there was a significant main effect for the goal-setting component  $F(1, 72) = 10.28$ ,  $p < .01$ , self-evaluation  $F(1, 72) = 99.93$ ,  $p < .01$  and strategy  $F(1, 72) = 14.23$ ,  $p < .01$ . There was also a significant interaction between self-evaluation and strategy  $F(1, 72) = 5.12$ ,  $p < .03$ , (see Figure 5) but there were no other significant interactions. Subjects ( $M = 70.00$ ) with dynamic cues expressed greater satisfaction with their dart throwing than those given fixed cues ( $M = 61.50$ ). Girls who self-evaluated ( $M = 79.00$ ) reported greater satisfaction than those who did not self-evaluate ( $M = 52.50$ ). Girls ( $M = 70.75$ ) assigned to analytic strategy group expressed greater satisfaction than those assigned to imaginal strategy group ( $M = 60.75$ ). Post hoc Tukey tests revealed significantly greater self-

Interaction Effect of Self-Evaluation and Strategy Use for Self-Reactions at Posttest



reactions for girls who were given an analytic strategy and self-evaluated ( $M = 87.00$ ) than for girls who were given an analytic strategy and did not self-evaluate ( $M = 54.50$ ),  $p < .05$ . It was also found that self-evaluation increased the positive self-reactions of girls who were given an imaginal strategy significantly (from  $M = 71.00$  to  $M = 50.50$ ),  $p < .05$ , but not as much as it did for girls given the analytic strategy.

Finally, the effect of the goal-setting, self-evaluation, and strategy on intrinsic interest was assessed. The ANOVA indicated a significant main effect for self-evaluation  $F(1, 72) = 118.81$ ,  $p < .01$  and a significant main effect for strategy  $F(1, 72) = 5.23$ ,  $p < .03$  but no significant main effect for goal-setting emerged. In addition, there were no significant interactions between the goal-setting, strategy and self-evaluation components. Girls ( $M = 1.88$ ) who self-evaluated ranked dart throwing more than those who did not ( $M = 3.90$ ). Girls ( $M = 2.68$ ) given an analytic strategy ranked dart throwing more than those given an imaginal strategy ( $M = 3.10$ ).

#### A Priori Comparisons

In order to test for the hypothesis that Zimmerman's model will surpass Singer's model on all dependent measures, t-tests were performed between the analytic strategy, dynamic cue and self-evaluation group and the imaginal strategy, fixed cue and no self-evaluation group. The

hypothesis was supported with significant differences between the two self-regulation groups respectively on all dependent measures: for dart throwing ( $M = 6.32$ ) and ( $M = 2.85$ ),  $t(10) = -20.82$ ,  $p < .01$ ; self-efficacy; ( $M = 93.25$ ) and ( $M = 42.25$ ),  $t(10) = -15.65$   $p < .01$  self-reactions; ( $M = 96.00$ ) and ( $M = 47.00$ ),  $t(10) = -11.44$   $p < .01$  and intrinsic interest ( $M = 1.30$ ) and ( $M = 4.10$ ),  $t(10) = 10.04$   $p < .01$ . However, t-tests conducted to detect any differences between the control and the imaginal strategy, fixed cue, and no self-evaluation treatment group (Singer's model) revealed no statistical significance for either dart skill, self-efficacy, or self-reactions and intrinsic interest.

In addition, a t-test was performed between the control group and the analytic strategy, dynamic cue, and self-evaluation treatment group (Zimmerman's model). Significant differences were found favoring the experimental self-regulation group on all dependent measures: for dart throwing ( $M = 2.60$ ) and ( $M = 6.31$ ),  $t(10) = -27.95$   $p < .01$ ; self-efficacy; ( $M = 44.50$ ) and ( $M = 93.25$ ),  $t(10) = -16.50$   $p < .01$  self-reactions; ( $M = 41.00$ ) and ( $M = 96.00$ ),  $t(10) = -15.52$   $p < .01$  and intrinsic interest ( $M = 4.50$ ) and ( $M = 1.30$ ),  $t(10) = 11.82$   $p < .01$ .

### Correlational Analyses

Correlations among the treatments groups and test measures are shown in Table 2. Specifically, dart skill was positively correlated with self-evaluation and strategy use.

Self-efficacy related positively to goal-setting, strategy use, and self-evaluation. Self-efficacy also significantly predicted subsequent dart skill performance. Self-reactions correlated positively with dart skill, goal setting, strategy, self-evaluation and self-efficacy. In addition, intrinsic interest was positively correlated with self-evaluation, dart skill, self-efficacy and self-reactions.

#### Analysis of Attributions

Subjects' attributions are displayed in Table 3. These attributions were classified by two coders and a high degree (99%) of inter-observer agreement was found. The subjects' responses were classified into six categories: strategy, practice, effort, ability, "I do not know" and other. The data revealed that girls who self-evaluated attributed their failure to hit the "bullseye" to ineffective strategy use whereas girls who did not self-evaluate including the control attributed their failure to ability and effort, chi square (5) = 57.00,  $p < .01$ .

Correlations between subjects' attributions and the dependent variables are shown in Table 4. These Spearman correlations were conducted to determine the predictiveness of these attributions to other outcomes. Girls who attributed their failure to hit the "bullseye" to strategy insufficiency demonstrated significantly higher levels of self-efficacy perceptions, achieved higher levels of dart-skill, were more satisfied with their performance and showed

greater intrinsic interest in the dart game. In contrast, girls who attributed their failure to ability or effort displayed low levels of self-efficacy, dart-skill, self-reactions and intrinsic interest. (see Table 4).

Table 2

Correlations between Independent and Dependent Variables (for Treated Subjects).

Variable	1	2	3	4	5	6	7
1. Goal setting <sup>a</sup>	1.00						
2. Self-evaluation <sup>b</sup>	.00	1.00					
3. Strategy <sup>c</sup>	.00	.00	1.00				
4. Dart-skill	.17	.74**	.50**	1.00			
5. Self-efficacy	.23*	.74**	.40**	.85**	1.00		
6. Self-reactions	.22*	.69**	.26*	.77**	.85**	1.00	
7. Intrinsic interest	-.03	-.77**	-.16	-.65**	-.72**	-.63**	1.00

\*  $p < .05$  \*\*  $p < .01$

<sup>a</sup> The dynamic goal was coded as 2 and the fixed goal as 1.

<sup>b</sup> Self-evaluation was coded as 2 and no self-evaluation as 1.

<sup>c</sup> Analytic Strategy was coded as 2 and imaginal strategy as 1.

Table 3

Frequencies of attributions for the control and the experimental groups

Groups	Attributions					
	Strategy	Practice	Effort	Ability	I Do Not Know	Other
No Self-Evaluation Control	0	2	3	3	1	1
Analytic Strat. Fixed cue	0	2	2	4	2	0
Analytic Strat. Dynamic cue	2	0	3	3	1	1
Imaginal Strat. Fixed cue	0	0	4	3	1	2
Imaginal Strat. Dynamic cue	0	0	6	2	0	2
Self-Evaluation						
Analytic Strat. Fixed cue	5	2	2	0	1	0
Analytic Strat. Dynamic cue	8	1	0	0	1	0
Imaginal Strat. Fixed cue	7	3	0	0	0	0
Imaginal Strat. Dynamic cue	7	2	0	0	1	0

Table 4

Correlations between Attributions and Dependent Measures  
(for all Treatment and Control Groups)

Variable	Attributions		
	Strategy	Ability	Effort
Self-Efficacy	.34**	-.31**	-.33**
Dart-Skill	.31**	-.26*	-.37**
Self-reactions	.27**	-.31**	-.32**
Intrinsic int.	-.33**	.26*	.35**
Self-evaluation	.56**	-.42**	-.40**

\*  $p < .05$  \*\*  $p < .01$

note: Intrinsic interest ranking reverse the usual order, 1  
 = first and 5 = last

## CHAPTER 5

## Discussion

A Comparison of the Two Models

This study sought to test the effectiveness of two models of self-regulated learning: Singer's (1988) Five-Step Model of Self-Regulated Learning and Zimmerman's (1995a) Dynamic Feedback Model of Self-Regulated Learning. These two models were compared on the basis of three common dimensions: goal-setting (fixed vs. dynamic), strategy (imaginal vs. analytic) and self-evaluation (absent vs. present).

Despite the fact that all experimental groups viewed identical videotaped demonstrations, girls who practiced in accord with Zimmerman's Dynamic Feedback Model of Self-Regulated Learning were more successful in acquiring dart skill than girls adopting Singer's Five-Step Model of Self-Regulated Learning. In support of hypothesis 4, components associated with Zimmerman's model enhanced not only dart-skill acquisition more than those associated with Singer's model but closely linked psychological processes, such as the learners' self-efficacy beliefs, self-satisfaction, and intrinsic interest. When examined separately, each component of Zimmerman's model surpassed the corresponding component of Singer's model. That is, an analytic strategy that focused on the strategic implications of errors was superior to an imaginal strategy that focused on a perfect

performance (hypothesis 1 was confirmed). A dynamic cue that focused on correcting the erroneous part of a performance was more effective than a fixed cue designed to direct attention away from performance cues. This provided support for hypothesis 2. The use of self-evaluative feedback was more effective than ignoring such feedback, and thus hypothesis 3 was supported. This suggested that keeping records of one's learning progress is essential to learning and should not be merely used when time permits.

Surprisingly, subjects who learned according to Singer's model did not significantly exceed the practice-only control group thus, failing to support hypothesis 5. This was unexpected because the Singer's model had been effective in prior research. However, it should be noted that the control group in the present study was shown an effective dart-throwing strategy and differed only in its methods of practice. Singer's studies also varied the method of instruction.

In addition, the comparison of Singer's optimal condition and the control group involved only 20 subjects. Thus, there was not a great deal of statistical power in this analysis. However, when the means in Table 1 are compared, there is little evidence to suggest that increasing the cell size will yield significant differences between the two groups. Singer's model was slightly higher on 3 out of 4 measures, and thus even if the full sample (N

= 90) could have been used in this analysis these differences would still be non-significant. Singer's model was lower than the control group in the fourth measure, self-efficacy, but this difference was not significant either.

Further, there was some evidence that girls in the control group spontaneously adopted a fixed cue goal during their practice. After the study, these control subjects were asked if they had focused on anything during their practice, and nine out of ten girls in this group indicated that they had used an outcome goal. This might also explain partially the lack of significant differences between Singer's condition and the control group on these measures. Finally, it should be mentioned that prior efforts to test Singer's model did not determine the effectiveness of each component but instead compared the model as a whole against other models. Thus, it is not possible to compare his results to these in the present study at a more detailed level.

Another reason limiting the effectiveness of Singer's model in the present study may have been due to the types of learners in the sample, namely, whether they were experts or novice performers. Singer (1988) describes his Five-Step Model as a sequence of procedures that outstanding athletes use when performing self-paced tasks or sports skills such as, serving in volleyball, but he also recommended that his model can be used by learners or performers at all skill

levels to increase motoric achievement. However, the findings of the present study suggest that Singer's model was less effective when used by novices. Perhaps, only experts can perform sophisticated or advanced movement patterns of the skill with less conscious control, as Singer emphasizes. A professional volleyball player does not have to think about service execution but rather thinks about the game situation and which of the several options is most appropriate for that particular situation. (e.g., whether or not to serve to the right, center or left court). For a novice volleyball player however, to serve without any conscious control, he or she must engage in hours of practice under favorable conditions to first master the key processes of the skill.

In accordance with a social cognitive view of self-regulated learning, student's use of learning strategies were critical not only in optimizing achievement but also in enhancing student's self-regulatory beliefs processes and motivation. Strategy use affected students' perceptions of self-efficacy, self-reactions, and subsequent intrinsic motivation. The results revealed that analytic strategy use not only improved students' learning of a novel motoric skill but also the girls' self-efficacy beliefs, their positive self-reactions to their progress and their subsequent intrinsic interest in the task more than an imaginal strategy. Changes in intrinsic interest were

accompanied by many spontaneous comments. For example, some girls expressed their satisfaction verbally regarding their performance and indicated that they enjoyed learning the skill, whereas, other girls mentioned that they were going to teach their siblings how to throw darts using the same method. Some girls even indicated their plan to buy a dart board with which to practice on their own.

The findings also indicated that setting dynamic goals which targeted erroneous aspects of one's prior performance assisted girls to increase their dart-skill and also their self-efficacy beliefs and positive self-reactions. The present results replicates previous research (Schunk & Swartz, 1993; Zimmerman & Kitsantas, 1996), showing that a process goal highlights the importance of strategy use, which in turn increases self-efficacy and skill more than does a product goal which focus on the outcome of the movement.

The results showed that self-evaluation in the form of self-recording plays a substantial role in the mastery of dart skill and also in increasing self-efficacy beliefs, positive self-reactions, and intrinsic interest in this game. In the present research self-evaluation was operationalized through the use of self-recording because of the importance of behavioral as well as cognitive forms of self-monitoring in social cognitive theory. It should be noted that Singer has not advocated behavioral self-

recording in his model but rather appears to rely on cognitive methods. Behavioral methods have the advantage of providing an on-going record for the learner to refer.

One of the most interesting findings is that self-evaluation interacted with strategy use and with goal setting. Post hoc tests showed that self-evaluative recording improved the effectiveness of the analytic strategy exponentially compared to imaginal strategy on the girl's self-efficacy perceptions. Self-evaluation also enhanced the effectiveness of dynamic goal setting exponentially compared to no self-evaluation on the girl's self-efficacy perceptions. Although the effectiveness of analytic strategy use and dynamic goal setting were expected to combine additively, the present results suggested that their joint use was even more effective.

Similarly, the interaction between strategy use and self-evaluation on subjects' self-reactions showed exponential effects. Post hoc tests revealed that self-evaluative recording improved the effectiveness of analytic strategy on the girls' self-reactions more than an imaginal strategy. Together these findings suggest that self-regulatory components in Zimmerman's model are greater than the sum of the parts.

The correlational results in the current study showed that self-efficacy, a key construct in self-regulation theory, was highly predictive of skilled performance. Self-

efficacy beliefs were also highly predictive of the girls' reactions and their intrinsic interest in pursuing the acquisition of this skill. These findings are consistent with prior research in academic settings which has shown that self-efficacy influences three dimensions of students' motivation: their choice of activities, effort, and persistence (Zimmerman, 1994).

Interestingly, the results also indicate that subjects who self-evaluated tended to attribute poor outcomes and failures to improper strategy use and practice whereas girls who didn't self-evaluate tended to attribute them to a lack of ability or to insufficient effort. Girls who made strategy attributions for failure displayed a much more favorable pattern of self-ratings than girls who attributed failure to a lack of ability or effort. Girls making strategy attributions showed higher self-efficacy, more positive self-reactions, greater acquisition of dart skill, and more intrinsic interest in the game. Thus, strategy attributions have the advantage of sustaining favorable self-reactions to learning outcomes and optimistic perceptions of self-efficacy to eventually learn and master the skill (Zimmerman & Martinez-Pons, 1992).

#### Limitations of the Study

The results of the present study involved (a) only the use of girls and (b) involved skill learning over a relatively short practice period. Although these findings

showed clearly the differences in the effectiveness of two approaches within these constraints, research with boys and studies over a larger time span are needed to extend the external validity of the present findings. It is also important to extend the findings to practicing other self-paced skills, such as hitting a tennis serve and to extend it to externally-paced skills, such as tennis ground strokes.

Finally, the present findings may not be generalizable to young children. Research on academic functioning has shown that children below approximately eleven years of age have difficulty in making accurate self-ratings, and generating accurate self-reflective, analytic and self-evaluative judgements (Stipek & Tannatt, 1984).

#### Educational Implications of the Study

Although motor learning, is often viewed in simplistic, non-cognitive terms, it is actually complex and cognitive. It requires simultaneously dealing with many task dimensions, such as time, flow, space, force, direction, form, body and spatial awareness, practice, and environment. Because of this complexity, motor learning requires high levels of self-directed practice. Teaching individuals to properly self-regulate their own learning processes during practice episodes is essential to mastering difficult motor learning skills.

To date, the main model that has been used to guide

self-regulatory learning in sports is Singer's Five-Step Model. The present results reveal that this model is limited in its effectiveness in developing motoric skill, self-regulating processes, positive self-beliefs and intrinsic motivation with novice learners. Fortunately this study did reveal a more effective approach, Zimmerman's Dynamic Feedback Model. These findings are critical for physical education teachers, sports instructors and coaches who must prepare their students to practice effectively on their own. Several specific recommendations can be made from this research. First, coaches need to teach effective self-recording methods to make students more aware of their initial shortcomings in skill. This will help them understand the need to try a more effective strategy and to concentrate on areas of deficiency as a goal during each practice effort or cycle. Periodically teachers can ask students to bring in their records to class to jointly decide on needed corrections. In this way teachers or coaches can shift their role from an authoritarian task master to that of a learning consultant who encourages students to independently self-evaluate and adjust their efforts in a self-regulated way. Alternately, complex motoric skills are developed and refined during long hours of practice. Unless students are equipped to self-manage these practice experiences optimally, their learning will suffer.

## Appendix A

### **Process Goal - Strategy Steps**

#### **Step 1**

Throw: Keep upper arm parallel to ground. Smooth arc-like release holding elbow steady.

#### **Step 2**

Wrist is bent back until a wrinkle is formed.

#### **Step 3**

Follow Through: Arm and wrist extended horizontally and palm facing ground, aiming at the target.

#### **Step 4**

While throwing, if dart goes right or left of target, correct verticality of forearm.

#### **Step 5**

While throwing, if dart goes high or low, correct follow through.

## Appendix B

**Explanation of the Scoring System**

<u>SCORE</u>	<u>PLACE</u>
7	Center
6	line 6
5	line 5
4	line 4
3	line 3
2	line 2
1	line 1
0	for outside the ring

## Appendix C

**Self-Efficacy Measure**

Name \_\_\_\_\_

Using the scale below answer the following questions by placing a number from 10 to 100 in the space provided:

1. How sure are you that you can score at least 7 with one dart \_\_\_\_.
2. How sure are you that you can score at least 5 with one dart \_\_\_\_.
3. How sure are you that you can score at least 3 with one dart \_\_\_\_.
4. How sure are you that you can score at least 1 with one dart \_\_\_\_.

10	20	30	40	50	60	70	80	90	100
NOT		SOMEWHAT			PRETTY			VERY	
SURE		SURE			SURE			SURE	

## Appendix D

**Intrinsic Interest Measure**

Name \_\_\_\_\_

**RANK A PHYSICAL EDUCATION UNIT****PLEASE READ CAREFULLY**

Choose one of the following sports units for a future physical education class. Rank from 1 to 5 in order of preference, 1 being the most favored and 5 being the least favored.

\_\_\_\_\_ DARTS

\_\_\_\_\_ VOLLEYBALL

\_\_\_\_\_ SOCCER

\_\_\_\_\_ GYMNASTICS

\_\_\_\_\_ TUMBLING

## Appendix E

**Self-Reactions Measure**

Name \_\_\_\_\_

Please read carefully and circle one of the numbers:

How satisfied are you with your dart throwing performance today?

10	20	30	40	50	60	70	80	90	100
NOT		SOMEWHAT				PRETTY			VERY
SATISFIED		SATISFIED				SATISFIED			SATISFIED

Appendix F

**Attribution Scale**

Name \_\_\_\_\_

Please read carefully and answer the following questions:

**1. Why do you think you missed the bull's eye at the last trial?**

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**2. What can you do to improve your performance?**

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## Appendix G

**The Graduate School and University Center  
of the City University of New York**Subject Consent Form

I agree to participate in a study to be conducted by Anastasia Kitsantas, a physical education teacher and a doctoral student at the Graduate Center (CUNY). I understand that I will be asked to perform a motoric task and to complete questionnaires about motor skill learning. My responses on these questionnaires will in no way effect my school grades.

I am participating in this study freely, and I understand that I can withdraw for the study at any time, without ant penalty. All the information about me will be kept confidential and my identity will not be revealed to any individual.

If I need any additional information about this study, I am free to leave a note to Ms. Kitsantas' mailbox.

I understand that I will not face any discomfort or risk by participating in the study. I also understand that my participation in the study may help teachers and students understand more about the acquisition of motor skills.

I understand that my participation will consist of performing a motor task as well as fill out some self-efficacy, self-reactions, intrinsic interest and attribution measures.

I understand that when the study is completed I will receive a certificate and a mystery gift from the Graduate School of the City University of New York.

Signature of Participant \_\_\_\_\_

## Appendix H

**The Graduate School and University Center  
of the City University of New York**

Parent or Guardian Consent Form

I agree to allow my child to participate in a study to be conducted by Anastasia Kitsantas, a physical education teacher and a doctoral student at the Graduate School and University Center of the City University of New York. The study is being conducted with the permission of the administration and faculty of my child's high school. I understand that my child will be asked to perform a motor task and complete some self-regulation scales. My child's responses on these questionnaires will in no way effect her school grades.

I realize that participation in this study is voluntary and I understand that my child may withdraw from the study at any time without any penalty. All the information about my child will be kept confidential and her identity will not be revealed to any individual.

If I need to have additional information about this study, I am free to call 212-982-0740 to talk with Ms. Kitsantas.

I understand that my child will not face discomfort or risk by participating in the study. I also understand that her participation in the study may help teachers and students to understand more about self-regulation and motor performance.

Signature of Parent/Guardian \_\_\_\_\_

If you are interested in receiving information regarding the results of this study, please place a check below on the space provided and give your address. A summary reflecting the overall results will be mailed to you. No individual names or score will appear.

\_\_\_\_\_ Please send me the results of this study.  
Address \_\_\_\_\_

\_\_\_\_\_

## Appendix I

**Process/Outcome-Monitoring**

Name \_\_\_\_\_

1. If dart goes right or left of target, correct verticality of forearm.

2. If dart goes high or low, correct follow through.

After you have completed each trial, write down the number of steps that you MISSED if any (1, 0 or 2), for each throw, on the space provided.

**Trial 1**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 2**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 3**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 4**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 5**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 6**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 7**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 8**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 9**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 10**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 11**  
Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

## Appendix J

**Posttest**

Condition: \_\_\_\_\_

NAME: \_\_\_\_\_

**Trial 1**

Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

**Trial 2**

Throw 1 \_\_\_\_\_ Throw 2 \_\_\_\_\_ Throw 3 \_\_\_\_\_ Total \_\_\_\_\_

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