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Investigating the Impact of Self-As-A-Model Interventions on Children's Self-Regulation of Learning, Swimming Performance, and Thought Processes

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Shannon Clark Larkin

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Thesis Abstract

This study compared the impact of a self-modeling intervention (viewing oneself perform an adaptive behavior) and practice, a self-observation intervention (viewing oneself perform at current skill level) and practice or practice alone on children's self-regulation of learning, anxiety, swimming performance and thought processes. A mixed methodology approach was employed as both qualitative and quantitative data were obtained. The quantitative component operated within Zimmerman's (1989, 2000) theory of self-regulated learning, and as such four self-regulatory processes (self-efficacy, motivation, self-satisfaction, and goal setting), as well as anxiety and physical performance were examined. For the qualitative component, the current study employed a think-aloud protocol (Ericsson & Simon, 1996) with the goal of understanding the thought processes that unfolded when children viewed self-modeling and self-observation videos. Thirty-three children, between the ages of six and ten (mean age = 8.3 years), were randomly assigned to a self-modeling group, a self-observation group or a control group. The children participated in an eight-day swimming intervention program. The analyses with the quantitative data showed consistently that the self-modeling group obtained superior scores on the measures examining the self-regulatory processes and physical performance as compared to both the self-observation group and the control group, with these two groups performing similarly. These results provide support for the implementation of self-modeling interventions with children learning motor skills. The analysis of the verbal protocols clearly showed that the majority of the children's verbalizations were self-evaluative in both a positive (Descriptive Positive), and negative (Descriptive Negative) direction, as well as, being related to future skill improvement (Prescriptive). These finding are discussed in terms of how they relate to Bandura's social cognitive theory of modeling (1977, 1986, 1997). A comparison revealed very few differences between the self-modeling and the self-observation interventions, suggesting that children appear to be gaining information about their skill performance and what to do to improve their next performance attempts regardless of the type of intervention.

CHAPTER 1 - Introduction and Literature Review

Introduction

Modeling refers to the process whereby an observer views a model demonstrating a skill and later attempts to perform that skill (Bandura, 1977, 1986, 1997). Overall, research on modeling has found that observing a model is a very effective method of transmitting important information to learners. In fact, skill acquisition is considerably enhanced when a model is observed (see McCullagh & Weiss, 2001 for a review). Despite this consistent finding, to date, no concrete evidence supporting the use of one particular model type has been promoted. Research, however, has suggested that employing a model that the observer finds similar to him/herself is most effective (Schunk, 1987). The interest of the current research is on the use of a particular type of model, the self-as-a-model. Since this type of intervention involves viewing oneself, it could be considered as the most similar model type possible.

It is acknowledged by researchers that there are two different types of self-as-a-model interventions, self-modeling and self-observation. It is important to distinguish between the two because often the literature uses the two terms interchangeably (Dowrick, 1999). Specifically, a self-modeling intervention occurs when observers are shown a videotape of themselves performing an adaptive behavior (i.e., successful) (Dowrick, 1991). Two main categories within the self-modeling context have been identified, along with several different sub-categories (Dowrick, 1999). The main categories consist of positive self-review and feed- forward self-modeling. Positive self-review is a re-constructive type of video that contains clips of the observer performing a task to the best of his/her ability, with all obvious error performances edited out. The purpose of using a video of this type is to encourage the frequency of the adaptive behavior. The second category is feed-forward self-modeling. This variant refers to a more constructive type of videotape. In a feed-forward videotape, the observers view themselves performing a skill that they have not yet achieved. For example, with a beginner swimmer that is unable to execute the front float, the self-modeling videotape would contain clips of the learner performing the front float, seemingly alone. In reality, the video would have been edited such that the instructor that was aiding him/her could not be seen on the video. In other words, the self-modeling videotape would make it seem as though the learner was performing the front float on his/her own. The current research is specifically interested in the positive self-review category of self-modeling.

Similarly, a self-observation intervention involves learners viewing a videotape of themselves performing the skills they are attempting to learn. Unlike a self-modeling intervention, however, a self-observation videotape is not edited and, therefore, contains error performances. Research has been conducted on the impact of self-modeling and self-observation interventions in several areas, however, research has yet to compare the effectiveness of these two different interventions.

Researchers have proposed theoretical explanations for the benefits of using each of these interventions. Dowrick (1999) proposed that self-modeling is a more effective intervention than self-observation because of the increase in cognitions and emotions that occur as the result of viewing oneself perform at a level of consistency that has not yet been accomplished. Conversely, one could argue that self-observation might be a more effective intervention because learners are able to view themselves performing at their current skill level and, thus, will be more effective at determining what their errors are in their current performance and apply this to their next performance attempts (Bandura, 1986).

There are three main objectives for this doctoral dissertation. First, I was interested in determining which intervention (self-modeling or self-observation) is most effective for learning swimming skills and has the greatest positive impact on children's self-regulation of learning and anxiety levels. The second objective was to investigate the relationships between the psychological processes that are proposed to be involved in the self-regulation learning. As a final objective, I was concerned with exploring children's thought processes while they were viewing self-as-a-model videos. To address these objectives, a particular theoretical framework has been selected and will be discussed in the following section.

The purpose of the following literature review is to a) discuss the theoretical frameworks of modeling in order to provide a rationale for the framework chosen for the present study, b) provide an overview of the research that has been conducted on self-modeling and self-observation to date, c) critique this research and identify gaps in the literature, and d) state the research questions that were explored in this dissertation.

Theoretical Frameworks of Modeling

The impact of modeling on behavior modification has been examined from two main viewpoints: the direct perception perspective and the social cognitive perspective. Proponents of the direct perception perspective posit that in order to understand modeling, researchers need to understand what people perceive, rather than how something is perceived (Scully & Newell, 1985). In other words, Scully and Newell (1985) argued that studies on modeling should focus on what information is picked up during the perception of biological motion and not on how the information is perceived or cognitively processed. Unlike the social cognitive theory of modeling, the direct perception viewpoint is not interested in how the information from observation is retained, nor does it consider any of the processes that might play a role in the modeling process, two areas that are of interest in the current research. In addition, most modeling research has adopted the social cognitive perspective, thus providing a solid grounding for future research (McCullagh & Weiss, 2001). For these two reasons, the social cognitive framework was used to guide the present research.

Social Cognitive Theory of Modeling

Extensive work has been done on developing a social cognitive theory of modeling, with Bandura (1977, 1986, 1997) at the forefront of this research. This theoretical framework has been developed mainly by examining the influence of social modeling on the acquisition of a variety of different skills (see McCullagh & Weiss, 2001 for a review).

Bandura (1977, 1986, 1997) describes modeling as a four-component process. The components consist of: a) attention processes, b) retention processes, c) reproduction processes, and d) motivation processes. These four processes interact to determine how well an individual learns a task through observation. Bandura has suggested that the attention and retention processes are related to the learning of a behavior or action and that the reproduction and motivation processes affect the performance of the observed behavior.

Attention processes refer to the importance of the observer selectively attending to the demonstration. An observer's attention is influenced by characteristics of modeled events and observer characteristics, such as the observer's level of arousal, cognitive capabilities, and expectations (McCullagh & Weiss, 2001). Bandura (1977, 1986, 1997) has proposed that using a model that observers find similar to themselves will enhance the attention of learners. Consequently, the attention paid to the model will assist learners in acquiring appropriate skill execution information.

It appears that the attention process may be the most important of the modeling processes. This is the case because the amount of attention that is paid to the model greatly influences the process of learning by modeling. Therefore, the proper choice of a model is imperative. The notion of employing a similar model, as perceived by the observer, to increase the learners' attention has been further supported by research on peer modeling in the classroom setting. Schunk and Hanson (1985) and Schunk, Hanson and Cox (1987) found that learners perceived peer models as most similar and, thus, paid more attention to the demonstration. This research on model similarity leads one to conclude that a self-model may in fact be the most appropriate model choice because watching oneself is the most similar type of model possible (more detail regarding model similarity is provided in a later section).

The second component of Bandura's (1977, 1986, 1997) theory, retention processes, refers to the extent to which learners retain the information and knowledge that was presented to them through observation. In order for observers to remember the skill when the model is no longer available, the information needs to be encoded in their memory in a symbolic form or cognitive representation, often referred to as a mental blueprint. The attention component of modeling is essential in this process as well because in order to form a cognitive representation that consists of the necessary information for skill execution, it is necessary for learners to have focused their attention on the modeled demonstration.

The reproduction process is the third component and involves the conversion of the retained cognitive representation into actions. Within this component, through the use of the cognitive representation, observers produce the modeled action. Subsequent to the performance attempt, the learners then compare their performance to their cognitive representation. If the produced action is not the same as the modeled action the learner observed, changes will be made to the cognitive representation until it corresponds with the action that they were viewing (Bandura, 1977, 1986, 1997). This process of being able to detect performance errors and then make corrections for the next performance attempt has been termed the error detection and correction mechanism. This same principle can be applied to self-as-a-model interventions. For example, in both self-modeling and self-observation learners would view themselves performing and compare their present performance to their cognitive representation. Adjustments to performance in the next trial continue across trials in an attempt to reach their desired performance standard.

The final component of observational learning is motivational processes. Motivation refers to the fact that the observer has to desire to perform the observed skill. Bandura (1977, 1986, 1997) has categorized these positive incentives into three categories; external, vicarious and self-incentives. Generally, when the observer knows that positive outcomes will result from the performance of the skill they will be motivated to perform the action (see Bandura & Barab, 1973). Motivation is also involved at another level when learning by observation. This refers to the extent to which the observer is motivated by the model to perform the task. This is another cognitive process where model similarity and attractiveness are important (McCullagh, 1986, 1987). The motivation process component is also present at the previous three levels (attention, retention and production) that are involved in the modeling process. For instance, the more the model is able to motivate the learner, the more likely it is that the learner will pay attention to the task, which will result in a better cognitive representation of the skill, leading to a more accurate reproduction of the skill. The observation of oneself on video is anticipated to motivate learners towards skill acquisition. The role of motivation in the self-modeling process will be discussed in greater detail in a later section.

In summary, it is apparent that these four processes: attention, retention, production, and motivation are all involved in the learning of motor skills through observation. It is important to note that modeling will not only have an impact on the learner's performance of physical skills, but it also has an effect on various psychological variables that are believe to be involved in motor skill learning and performance, such as self-efficacy (see McCullagh & Weiss, 2001). Interestingly, Bandara's (1977, 1986, 1997) social cognitive theory of modeling is closely related to his theory of self-efficacy (Bandura, 1997). There is powerful theoretical support for a strong positive relationship between modeling and a learner's self-efficacy beliefs. As such, many modeling studies have incorporated self-efficacy measurements into their studies' designs. The following section will describe Bandura's theory of self-efficacy and indicate the importance of this measure in the current study.

Self-Efficacy Theory

According to Bandura (1977, 1986, 1997), self-efficacy is the degree to which one believes that he or she can successfully perform a particular action or behavior.

Bandura further indicates that self-efficacy is specific to the learning situation, and not a global factor. Therefore, an individual who has strong feelings of self-efficacy for one skill does not mean that he or she will have strong self-efficacy beliefs towards performing another skill. Bandura has identified three dimensions of self-efficacy: a) magnitude, b) strength, and c) generality. Magnitude refers to the circumstances under which one believes they can perform a certain task. Strength is the extent of one's belief or confidence in his or her ability to perform that task. Finally, generality refers to the degree that one can extend his or her expectancy beliefs to other similar actions or behaviors.

Research has shown that self-efficacy can be a very strong determinant of successful performance. It is widely recognized that successful elite athletes tend to be more confident in their abilities and exhibit very high levels of self-efficacy beliefs regarding their sport performances. Feltz and Chase (1998) reviewed 11 studies on self-efficacy and sport performance and discovered that there was a significant to moderate relationship between self-efficacy and sport performance, meaning that the higher an athlete's self-efficacy beliefs, the more successful their performance. The literature generally agrees that self-efficacy can be modified and enhanced with the use of appropriate techniques.

The four most influential sources of self-efficacy information have been identified as: a) past performance experiences, b) vicarious experiences, c) verbal persuasion, d) physiological states (Bandura, 1977, 1986, 1997). These sources are often used as techniques for increasing the learner's self-efficacy beliefs. The two most important sources of self-efficacy information are derived from vicarious experiences and past performance experiences. Vicarious experiences occur when a learner is observing an individual perform an action; he/she views the results of the models performance and then constructs his/her own expectations regarding their actions (Bandura, 1997). Thus, the modification of self-efficacy beliefs is achieved through modeling. Past performance experiences were identified as the most influential source of self-efficacy information. This refers to the impact that one's previous performances have on an individual's self-efficacy beliefs. For example, a successful performance in the eyes of a learner would result in increased perceived competence in his/her ability to successfully complete the skill in subsequent performance attempts. This source of self-efficacy information would suggest that viewing the self-as-model would be an extremely informative source of self-efficacy information for learners.

Besides self-efficacy, other psychological variables have also been proposed to be involved in the modeling process. Some of the more commonly suggested variables include anxiety, goal setting and motivation (McCullagh & Weiss, 2001). As it will be shown, self-efficacy is the most extensively examined psychological variable in modeling research. The following section will focus on research that has examined the influence of model similarity on motor skill performance and psychological dimensions. This will provide a clear argument for the use of the self-as-a-model as an effective modeling intervention.

The Model Similarity Issue

It has been suggested by various researchers that the effects of modeling on the learner's performance and psychological responses are dependent on the observer's perceived similarity to the model (e.g., McCullagh & Weiss, 2001). Perceived similarity can be related to the following model characteristics: model gender, ability level, and the similarities of the problems encountered by the observer and the model (Bandura, 1997; Schunk, 1987).

In terms of model ability level and gender, Gould and Weiss (1981) compared the effect that similar and dissimilar models making various self-efficacy statements had on the observers' performance of a muscular endurance task, and their feelings of self-efficacy regarding their performance. The female participants observed a non-athletic female (similar model) or an athletic male (dissimilar model). The models verbalized positive self-efficacy statements, negative self-efficacy statement, irrelevant statements or no statements, creating four different observed model groups. Gould and Weiss (1981) reported that the groups that observed similar models were superior at performing the task and showed higher self-efficacy beliefs than those in the dissimilar model group.

George, Feltz and Chase (1992) replicated and extended the Gould and Weiss (1981) study in order to determine exactly what model characteristics (model ability or model gender) were superior at improving motor skill performance and self-efficacy. The participants were females with virtually no athletic experience. They used four modeling conditions in their study: an athletic female, an athletic male, a non-athletic female and a non-athletic male. The results showed that the participants in either the male or the female non-athletic groups performed better on the leg extension endurance task and had higher levels of self-efficacy, than the participants in either the male or female athletic groups. This indicated that model ability was more important to observers than gender. Substantiating again that performance can be enhanced when the observer perceives the model as similar (in this case referring to skill level). In addition, the observers who perceived the model as similar to them also indicated higher levels of self-efficacy as compared to the other experimental groups.

More recently, two groupings of model types have been compared, learning versus correct models and coping versus mastery models. Specifically, a correct model is identified as a model that continually performs the skill perfectly, whereas, a learning model is attempting to learn the skill and has not yet achieved a perfect performance of the skill, as well the observers are able to hear the feedback that is been given to the learning models (McCullagh & Meyer, 1997).

In some experiments, the learning model has been shown to elicit better performance in learners when compared to a correct model. McCullagh and Caird (1990), for example, compared a correct model with a learning model for the acquisition of a timing task. The observers that viewed the learning model performed the task better than the group that observed a correct model. This outcome has also been shown with the more complex physical skill of tennis (Hebert & Landin, 1994). One of the rationales given in both of these experiments to explain why the learning model group elicited superior performance as compared to the correct model group was due to the model similarity issue. The fact that the learning model was just beginning to learn the skill gives this model more elements in common with the learner, and this provides the learner with the motivation and confidence to learn the skill because they may feel that if the model can do it, so can they.

Similar to learning and correct model types are coping and mastery models. A difference however, is that correct and learning models differ only in terms of skill level. Whereas, coping and mastery models not only differ in skill level, they also differ in the types of statements they verbalize reflecting their psychological state. Schunk and Hanson (1985) identified two types of peer models, peer coping models and peer mastery models. A coping model demonstrates a progression in their learning from high perceptions of task difficulty to low perceptions of task difficulty, and from low feelings of self-efficacy to higher feelings of self-efficacy ("I cannot do it" towards "maybe I can do it"). In other words, the model indicates that they find performing the task very difficult, but as they try the task their statements gradually change and they begin indicating that they find the task easier to perform. In addition, their performance of the task is not perfect. Thus, the coping model is akin to the learning model. In contrast, a mastery model shows no difficulty in performing the task throughout the observation, and continually verbalizes strong feelings of self-efficacy ("I can do it"), similar to a correct model.

These model types have been studied by Schunk and Hanson (1985) and Schunk, Hanson and Cox (1987). For example, Schunk et al. conducted a study to test the impact of coping and mastery models in the academic environment in terms of learning, self-efficacy and academic performance. The researchers used the mathematical skill of fractions as the skill that the participants had shown difficulty learning. The participants were assigned to either a peer mastery model group or a peer coping model group. On the post-test, the children in the peer coping group showed higher self-efficacy and fractions skills, than the peer mastery group. Thus, support was shown for using a coping model to increase feelings of self-efficacy and raising skill level. Overall, this study's results provide support for the suggestion that, not only can self-efficacy beliefs be modified through observation, but that similar models are superior at causing this modification.

From this concise review of the research that has examined the model similarity issue, it is obvious that there is valid support for the suggestion that a more similar model is the most effective type of model to observe in order to enhance skill performance and psychological responses. Considering that the self is the most similar model possible, it is probable that a self-as-a-model intervention would be most appropriate for learners. Employing a self-as-a-model intervention for skill acquisition is a relatively recent area of modeling investigation. Regardless of this, a number of studies have used this technique and these will be described in the following sections.

An Overview of Self-As-A-Model Research

Classroom Behavior and Cognitive Skills

Self-Modeling Research. The overwhelming majority of the research on self-modeling has been conducted in the classroom setting. To date, these self-modeling interventions have focused on its influence on behavior change, specifically with children exhibiting behavioral problems, off-task classroom behavior, and other challenging problems. As it will be shown, the research findings clearly indicate the merits of using self-modeling interventions to elicit behavior change.

Self-modeling was introduced as a clinical intervention mainly in the educational setting for increasing desired behaviors or decreasing undesirable behaviors. Two of the most common behaviors to be treated include selective mutism and disruptive classroom behavior. For example, a number of self-modeling interventions have been conducted to encourage children with selective mutism to begin talking in class (Bray & Kehle, 2001; Buggey, 1995; Kehle, Owen, & Cressy, 1990; Pigott & Gonzales, 1987). To do this, children were videotaped speaking comfortably at home. These tapes were then edited to make it seem as though the child was in the class answering the teacher's questions. This type of self-modeling intervention has been shown to be extremely effective for increasing the children's speaking behavior in class. Children's disruptive behavior can also be a challenge for teachers. Self-modeling interventions have also been shown to be effective for managing this problem. For example, numerous researchers (Clare, Jenson, Kehle & Bray, 2000; Kehle, Clark, Jenson & Wampold, 1986; Lonnecker, Brady, McPherson & Hawkins, 1994; Miklich, Chida & Danker-Brown, 1977; Possell, Kehle, Mcloughlin & Bray, 1999; Walker & Clement, 1992; Woltersdorf, 1992) significantly reduced children's off-task behavior that disrupted classroom activities by showing edited videotapes of the child performing only appropriate classroom activities.

A few self-modeling studies have also been conducted in other settings. For example, Hosford and Johnson (1983) used self-modeling to improve counselor's interviewing behaviors and Houlihan et al. (1995) constructed a self-modeling intervention to encourage a disabled adult to participate in field trips. Both of these studies showed positive results in favor of the self-modeling intervention.

It is important to note that the research studies reviewed up to this point have employed single-case research designs that included one, or a small number of participants. Due to this, the results are very specific to each situation and, therefore, not generalizable to other populations. In contrast to these studies, Schunk and Hanson (1989) chose to employ an experimental research design with a large number of participants (n = 54) learning a cognitive skill. The self-modeling intervention was designed for children who were having difficulty learning mathematical problems.

Schunk and Hanson were not only interested in the intervention's impact on mathematics performance, they were also curious about whether or not the children's self-efficacy beliefs towards math would be raised as a result of the intervention. To do this, Schunk and Hanson (1989) conducted three experiments with children who had difficulty learning fractions. The researchers assigned the children to one of three groups. One group viewed themselves as a model, another viewed a peer model, and the final group did not view a model. Collectively, the results from the three experiments indicated that all the children improved their fraction abilities; however, there were no differences between the experimental groups in terms of mathematics performance. Interestingly, the children in the self-modeling group indicated significantly higher self-efficacy beliefs for fractions than the other experimental groups.

Self-Observation Research. In contrast to the abundant amount of research that has examined the impact of self-modeling interventions with the learning of cognitive skills and behavior change, there exists a relatively small number of research studies that have investigated self-observation in this setting (e.g., Ho, Hosford, & Johnson, 1985; Kose, Solomon, & Mark, 2003). Ho and colleagues compared the effectiveness of a self-observation intervention versus an other-model intervention with counselor trainees who were learning to improve counselor-client interactions. The effect of these interventions on anxiety levels and the recall of verbal and non-verbal behaviors were recorded. The findings indicated that the self-observation intervention was superior to the other-model intervention at increasing the trainees' recall of non-verbal behaviors. An additional study supporting the use of self-observation interventions was conducted by Kose et al. In their first experiment they examined children's performance on a cognitive task and found that the self-observation of their prior performances promoted the acquisition and transfer of procedural knowledge for problem solving. For the second study, the researchers attempted to assess what factors contributed to the effectiveness of the self-observation intervention and they discovered that the positive effect was simply due to the observation of one's performances.

Motor Skill Acquisition

Self-Modeling Research. Contrary to the research on self-modeling with cognitive skills, a limited number of self-as-a-model studies have been conducted with motor skills. The studies that have been conducted have involved small numbers of participants, with the results generally being in favor of the self-modeling intervention. These studies have been conducted both with children with physical disabilities and able-bodied children.

Dowrick and Dove (1980) and Dowrick and Raeburn (1995) both assessed the impact of a self-modeling intervention on the performance of motor skills. More specifically, Dowrick and Dove examined the impact of using a self-model to improve the water skills of children with spina bifida. This study found that the use of a self-model improved the participants' water skills. Dowrick and Raeburn (1995) conducted a study with physically disabled children who had difficulty performing every day activities such as walking unaided, tying shoelaces, etcetera. Each child developed his/her own list of skills that he/she had difficulty learning and from that list two skills were chosen to be videotaped. A self-modeling videotape for one of the skills was constructed by editing the tape to show the child performing the skill perfectly, where as, the other skill received no intervention. Upon the completion of the six-session intervention, each child's performance of the self-modeling skill and the non self-modeling skill was compared. As with the Dowrick and Dove (1981) experiment, it was also discovered that the children performed the self-modeling skill with the greatest proficiency.

Self-modeling studies have also been conducted with able-bodied participants attempting to learn motor skills. One such study was conducted by Drazin (1985) with golfers. A self-modeling group, an other-modeling group and a control group were formed. The golfers in each group participated in a series of tournaments where cash prizes were offered to those who successfully made the most putts. The results showed that the two modeling groups performed better than the control group, however, the self-modeling group won significantly more prizes than the other two groups. Melody (1990) has investigated the use of a self-modeling in the sport of basketball. To do this, college basketball players viewed a videotape of themselves performing free throws successfully in a game situation for two weeks. This descriptive study indicated that self-modeling dramatically improved the players' free throw percentages.

Some researchers have attempted to assess not only the impact of a self-modeling intervention, but also to delineate the psychological mechanisms involved in the self-modeling process (Bradley, 1993; DeGhetaldi, 1999; Starek & McCullagh, 1999; Winfrey & Weeks, 1993). Winfrey and Weeks (1993) investigated the impact of a self-modeling intervention on balance beam performance, self-efficacy beliefs and performance ratings. The researchers assigned the participants to a control group or a self-modeling group. The results indicated that the only difference between the self-modeling group and the no model group was that the self-modeling group was more accurate at providing self-rated performance scores that correlated with the actual performance scores that were given.

In addition to self-efficacy, researchers have also introduced other potential psychological variables. For example, Bradley (1993) assessed the relationship between goal setting, goal commitment, self-modeling, and self-efficacy beliefs for the task of basketball free throws. The researcher assigned the participants to a positive self-modeling group, a negative self-modeling group (i.e., watching oneself perform poorly), or a control group. The positive self-modeling group performed significantly better than the other two groups in terms of free throw performance and self-efficacy beliefs.

More recently, Starek and McCullagh (1999) added another psychological dimension, anxiety, by comparing the impact of a peer modeling versus self-modeling on swimming performance, self-efficacy beliefs, and anxiety with beginner swimmers. To do this, the researchers randomly assigned participants to watching either a peer-modeling videotape or a self-modeling videotape before each swimming lesson. Swimming proficiency, self-efficacy, and anxiety were measured during each of four swimming sessions. A follow-up test occurred after the final swimming lesson. The results showed moderate support for the use of a self-model when compared to a peer-model, as performance differences between the two groups were noted. In terms of self-efficacy and anxiety, however, the two groups performed similarly. The authors attribute this lack of significant findings to the small number of participants and suggest the possibility that a different psychological variable influenced performance outcomes.

Finally, GeGhetaldi (1999) conducted a similar experiment with beginner rock climbers. This study examined the effects of self-modeling on rock climbing self-efficacy, motivation, performance and rock climbing knowledge. The experiment consisted of a self-modeling group and a control group. The results showed that the self-modeling intervention was effective at increasing the participants' levels of intrinsic motivation, however, the other dependent measures increased equally in both groups.

While I was interested in studying the psychological variables involved in self-as-a-model interventions for the current research, I was also interested in learning more about what children are thinking about/attending to while watching video feedback. Through the collection and analyses of this type of information, I anticipated that it would provide insight into how children use self-modeling and self-observation interventions to learn swimming skills. To accomplish this, I deemed that a qualitative assessment of self-modeling and self-observation was necessary in order to gain a broad understanding of these two techniques. To date, only one study by Ram and McCullagh (2003) has attempted to qualitatively investigate the use of a self-modeling investigation. Using a think-aloud protocol (Ericsson & Simon, 1996), Ram and McCullagh tapped into what intermediate, college-aged, volleyball players were thinking about while watching themselves on videotape. Unfortunately, the information obtained was not especially rich in terms of the verbalizations reported by the participants. Ram and McCullagh did conclude, however, that viewing the self as a model does command the attention of the observer. Thus, providing support for further investigations into the cognitive processes that may underlie the self-modeling process.

A think-aloud protocol was included in this research to tap into the participant's thought processes. This technique, specifically referred to as concurrent reporting (Ericsson & Simon, 1996) allows participants to verbalize all thoughts that come to mind while engaged in a task. Generally, research has used think-aloud protocols while participants were performing a cognitive task or executing a physical skill (e.g., Nevett & French, 1997). In the case of modeling research, participants were asked to verbalize all thoughts that occur while watching a video of themselves. This type of think-aloud protocol should provide a greater comprehension of the thought processes engaged in during video feedback. Such an understanding would provide increased insight into what children are paying attention to while they view themselves performing swimming skills. This is important because at this point little is known about the specific types of information that is retained by learners. By developing an awareness of what children are focusing on when they engage in video feedback will allow teachers and coaches to optimize the use of this technique.

Self-Observation Research. Similar to the research examining self-modeling and motor skill performance, there are a limited number of studies that have examined self-observation intervention with individuals learning motor skills (e.g., Carroll & Bandura, 1990; Laguna, 1996; Zetou, Fragouli & Tzetzis, 1999). For instance, Zetou et al. (1999) conducted a study with children learning two volleyball skills. The children either viewed an expert model or themselves performing at their current skill level (self-observation). The results supported the use of a self-observation intervention for improving children's volleyball skill performance. Another study by Erbaugh (1985) examined the use of self-observation with children learning stability tasks. The findings indicated that the children who engaged in self-observation were superior at making corrections to their movements later in the learning trials, as compared to the groups that received other types of visual feedback.

The use of self-observation interventions have also been reported in the competitive sport setting, although in the competitive environment this technique has generally been termed video replay. It is common knowledge that video replay techniques are frequently used to learn specific skills in sports such as diving and gymnastics, as well as for mastering plays in football and soccer, however, research studies describing the use of this technique in the competitive sport context are virtually non existent.

Two limitations were noted in the motor skill studies that were reviewed in this section. First, the number of participants that participated in each of the studies was relatively small. For example, in some cases group comparisons were made with only five participants in each group. A second limitation is that many of the reviewed studies did not measure anything but the outcome behavior; very few studies incorporated psychological measures into their research designs. Researchers have suggested that psychological variables should also be considered in modeling research (McCullagh & Weiss, 2001). It should be noted that the studies that did include psychological measures consistently chose to measure self-efficacy beliefs. Indeed, the theory on self-efficacy and modeling would suggest this relationship (Bandura, 1997). Notable, though, is that while other psychological variables have also been studied; they have not received as much attention. These variables are: anxiety, motivation, and goal setting. Interestingly, these psychological variables have been identified as being related to how individuals self-regulate their learning process, however, self-as-a-model interventions have yet to be investigated within a self-regulation of learning framework. This has been suggested as a fruitful area for future research by numerous sources (e.g., Dowrick, 1999; Starek &

McCullagh, 1999). For that reason, a social cognitive theory of self-regulated learning was adopted as the conceptual framework for this research and a rational for choosing this theory will be provided in the following sections.

Self-Regulation

Researchers in many different areas of psychology have investigated self-regulation and, as a result, numerous theories have been put forth to explain how and why people self-regulate. For example, behavioral theories such as control theory and cybernetic theory (Carver & Scheier, 1999), as well as, socio-cultural theories (Luria, 1982; Vygotsky, 1962, 1978) have been formulated. Since the theoretical framework for this project stems from the social cognitive theory (Bandura, 1986), I decided to remain consistent and to adopt the same perspective for the study of self-regulatory processes.

According to the social cognitive perspective, self-regulation consists of the processes involved in the activation and sustaining of cognitions, as well as behaviors and affects that are oriented towards goal achievement (Zimmerman, 1989). Based on Bandura's (1986) social cognitive theory of the self-regulation of behavior, Zimmerman (1989, 2000) proposed a triadic theory of self-regulated learning. In line with the assumptions of a social cognitive theory, Zimmerman's theory involves the relationship between the person, the behavior and the environment (see Figure 1). The environment-component of the theory refers to outside influences that can impact the learning process. For instance, this can be in the form of feedback or teaching strategies, such as video feedback. These environmental influences then impact the self/person-component of the theory by impacting an individual's thoughts, attitudes and beliefs that are involved in one's self-regulatory process. These self-regulatory processes then have a mediating influence on behavior outcomes. The behavior-component consists of the outcome or the goal of the learning process, therefore, it can refer to a cognitive skill, such as learning to read, or learning a physical skill, such as swimming, which is the case in the current study.

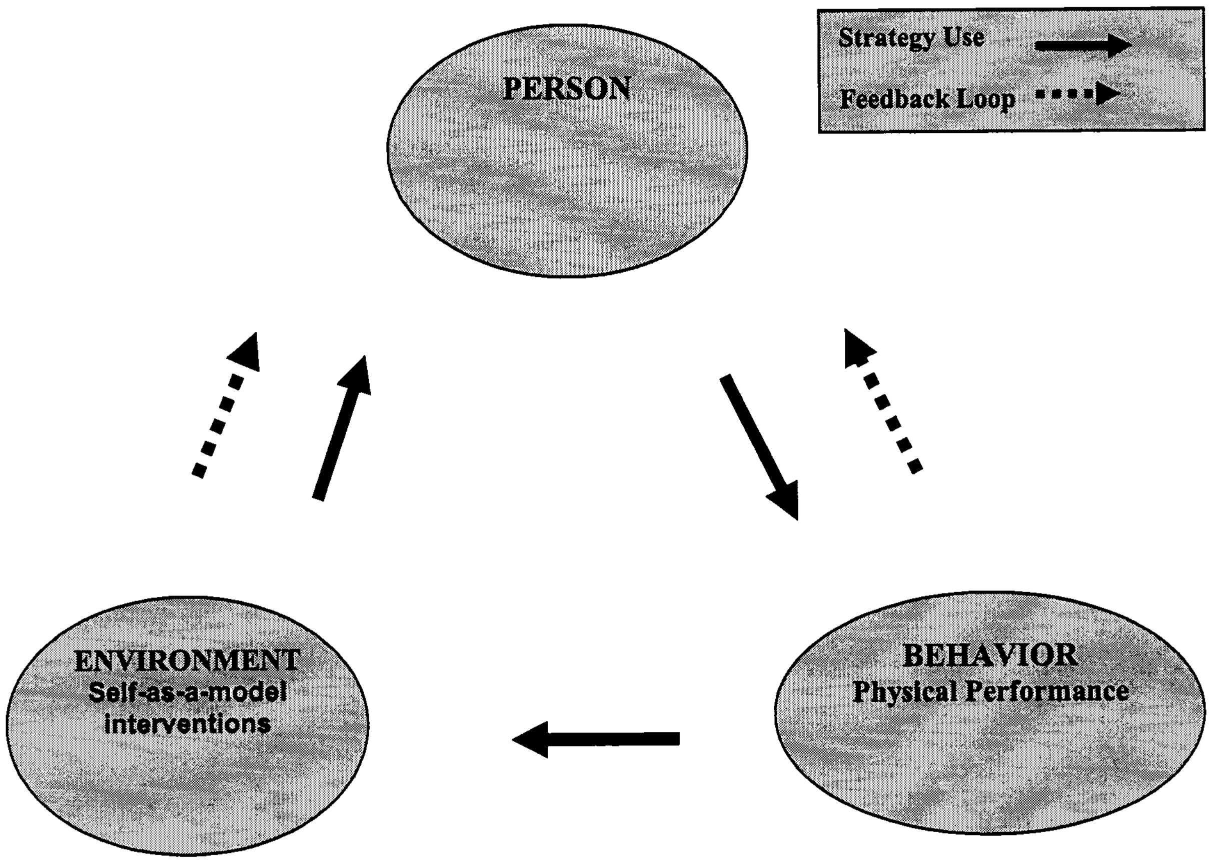

Figure 1. Triadic forms of self-regulation. Note. From "A social cognitive view of self-regulated academic learning." By B. J. Zimmerman, 1989, *Journal of Educational Psychology, 81,* p. 330. Copyright © 1989 by the American Psychological Association. Adapted with permission.

Zimmerman (1989, 2000) further defined the self-component of his theory by developing a cyclical theory of self-regulation (see Figure 2), which is specifically designed to explain the self-regulatory processes involved in academic and motor learning. In the following section, this cyclical theory of self-regulated learning will be described, with special emphasis on the self-regulatory processes that will be measured in this research.

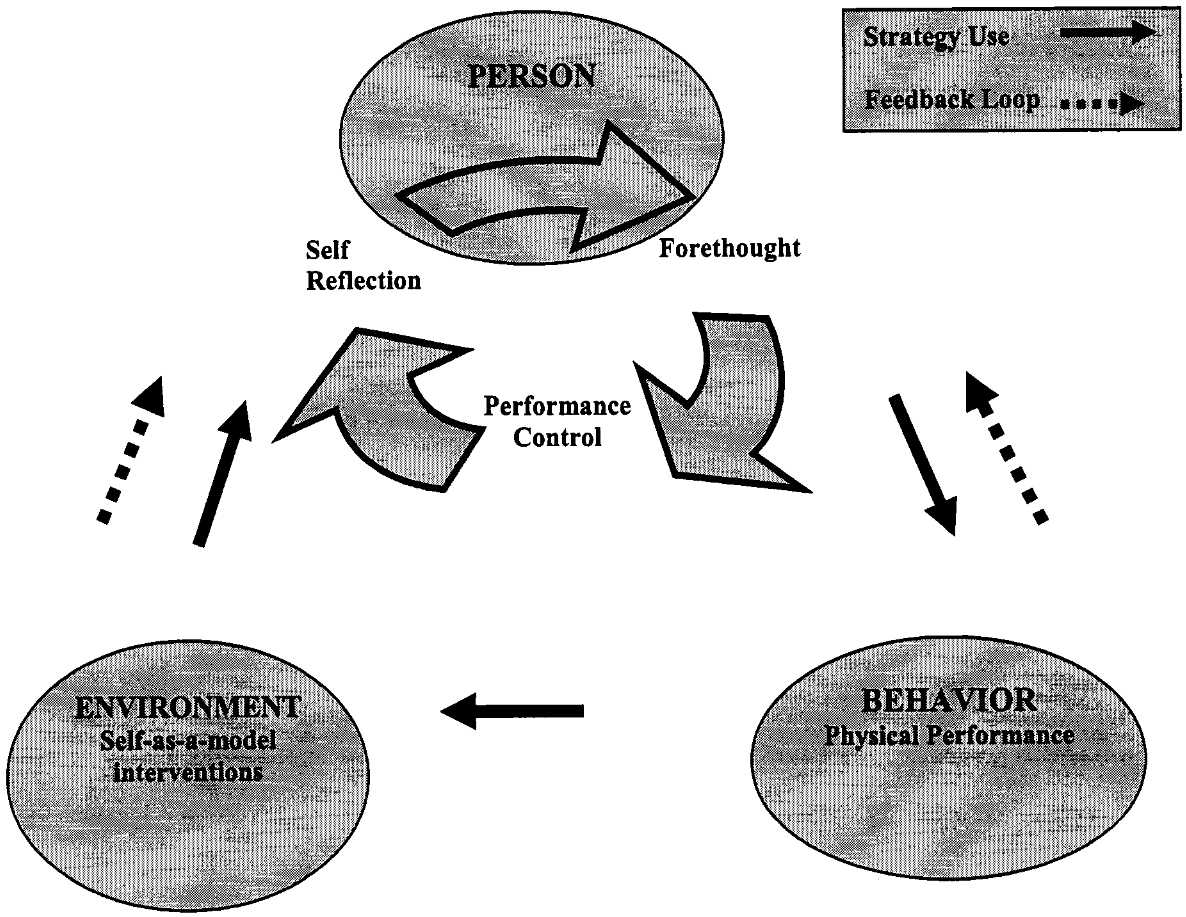

Figure 2. Triadic forms of self-regulation with the cyclical theory of self-regulated learning. Note. From "A social cognitive view of self-regulated academic learning." By B. J. Zimmerman, 1989, *Journal of Educational Psychology, 81,* p. 330. Copyright © 1989 by the American Psychological Association. Adapted with permission.

Social Cognitive Theory of Self-Regulation in Learning

Zimmerman's (1998; 2000) theory consists of three phases: forethought, performance or volitional control, and self-reflection processes.

Forethought. Forethought consists of the processes that precede one's actions and enable the actions to occur (Bandura, 2001; Zimmerman, 2000). Zimmerman describes forethought as consisting of two categories, task analysis and self-motivational beliefs. An important component of task analysis is goal setting. Schunk (2001) found that learners who effectively self-regulate their learning process organize their goals hierarchically, such that process goals (i.e., smaller short term goals) are considered as stepping stones in the attainment of the ultimate outcome goal (i.e., the final long term goal). In addition, Bandura and Schunk (1981) have shown that self-efficacy and motivation are also linked to process goal setting because students that set process goals and reached them reported higher self-efficacy beliefs and motivation than those who set only outcome goals. Strategic planning is another component of the task analysis sub-process and involves devising a plan of action to assist with acquiring a new skill. This usually takes place when a learner selects a learning strategy, such as, time management techniques or verbal rehearsal (Zimmerman, 2000). Moreover, it is important to note that these strategies may need to be adjusted as the learning process progresses and that they are specific to each individual learner.

Self-motivation beliefs are the second category of forethought because goal setting and strategic planning are considered useless unless the learner is sufficiently motivated to follow through with the learning process. This category consists of self-efficacy, outcome expectations, intrinsic interest, and goal orientation; all shown to be important to the entire process. Self-efficacy is important here because the more competent learners feel about their abilities, the more likely they are to strive to achieve these goals (Locke & Latham, 1990). Furthermore, a more self-efficacious person is more likely to persist at acquiring a skill even when they are having difficulty progressing. The learners' outcome expectations are also an important component of self-motivational beliefs because more desirable outcome expectations can lead to greater self-motivation (Zimmerman, 1998). Intrinsic interest in learning the task also increases self-motivation because learners will be more likely to persist at the task if they are doing it because they enjoy it. Finally, goal orientation is important because learners who select process goals will have the opportunity to be successful on more than one occasion during the learning process. Consequently, these experiences of success can lead to higher self-efficacy beliefs. For example, Pintrich and Schunk (1996) found that a process goal orientation was more effective at motivating learners and improving the acquisition of skills to a greater extent than outcome goal orientations.

In the forethought phase, learners are often provided with a demonstration of how to perform the skill they are attempting to learn. Social modeling is key to the forethought phase because learners generally base their expectations on what they see in the modeled demonstration. This type of social modeling is argued to be necessary in order for learners to have a basic idea about how to perform a task. As has been discussed previously, research on modeling has not only shown that this instructional technique provides task information to learners, but it has also shown that self-efficacy and motivational information is also transmitted to learners (Schunk, 1987). As such, it is likely that a self-as-a-model intervention would influence the forethought phase through the processes of goal setting, self-efficacy, and motivation, and by providing valuable information to the learner about skill execution.

Performance or Volitional Control Phase. This phase is concerned with the processes involved in the overt performance of a task. Three components have been deemed important in this phase: self-control, self-observation and social comparisons. The first component, self-control, consists of activities that aid learners in focusing on the task at hand, such as, self-instruction, imagery, attention focusing, and task strategies. These activities have been well documented and show that they are effective in promoting the self-regulation of the learning process (see Zimmerman, 2000).

The second component that is involved in the performance control phase is self-observation. It is important to note that this type of self-observation does not involve modeling. More specifically, this component refers to how learners monitor their performance, the conditions that surround it, and the effects that it produces (Zimmerman & Paulsen, 1995). This is an extremely important process and can have a large impact on how a learner self-regulates his/her learning. Similar to Bandura's (1986) theory, Zimmerman (2000) also advocates the importance of learners monitoring themselves as they are performing a task. Learners need to ensure that they are recording performance accomplishments and that their self-observations are accurate, in order to effectively self-regulate. It is also suggested that learners should not only focus on overt performance, but also become aware of their thoughts and emotions (Zimmerman & Kitsantas, 1996).

Finally, social comparisons involve learners comparing their performances with classmates or a teacher in order to self-evaluate how close they are to performing the skill correctly. With a self-as-a-model intervention, it is likely that learners will compare their current performance to how they are observing themselves perform on video. During skill performance, learners keep in mind the information they learned from others and self-evaluate the progress of their own performance to this standard. Research has shown that learners who compare themselves to similar models have increased self-efficacy beliefs (Schunk & Hanson, 1985; Schunk, Hanson, & Cox, 1987).

Self-Reflection Phase. The final phase in the self-regulatory process of learning involves the processes that occur following a performance attempt. The self-reflection phase consists of two self-regulatory processes, self-judgment and self-reactions. Self-judgments refer to the self-evaluation of one's behavior. In order to self-evaluate, a learner compares his/her self-monitored information with a set standard or goal that was pre-determined. With a self-as-a-model intervention, the learners would use the videotape of their performances in order to form their judgments.

Two forms of self-reactions have also been identified as being involved in the self-reflection phase, these are: self-satisfaction and adaptive inferences (Zimmerman, 2000). Self-satisfaction simply refers to the learners' satisfaction or dissatisfaction with their performance. In fact, learners' motivation and self-efficacy beliefs can result from their perceptions of self-satisfaction, as increased satisfaction results in increased motivation and self-efficacy beliefs. Furthermore, learners tend to pursue activities that result in satisfaction and to avoid those that result in dissatisfaction (Bandura, 1991). Finally, adaptive inferences refer to how learners perceive the need to change their self-regulatory approach to learning in subsequent attempts, in order to improve performance (Zimmerman, Bandura, & Martinez-Pons, 1992). This self-reflective process enables learners to choose new strategies for self-regulating their learning.

Noteworthy is that self-reflections will have an impact on one's forethought for his/her subsequent performance attempts, resulting in the cyclical nature of the self-regulatory process. For example, positive self-reflections will increase learners' self-efficacy beliefs about eventually being capable of performing the task (Schunk, 1996). This will, in turn, increase the learners' motivation to continue persisting towards attaining their goals. This increased motivation and persistence will increase the learners' chances of succeeding, and increased success will result in increased self-efficacy beliefs and motivation.

I proposed that employing a self-as-a-model intervention would have an impact on how learners' self-regulate. This led to the hypothesis that viewing oneself perform would first influence the forethought phase of self-regulated learning, which in turn would influence the other phases due to the cyclical nature of self-regulation in learning. Due to the fact that a self-modeling intervention involves learners viewing themselves perform to the best of their ability, I further proposed that this intervention would have a greater positive impact on how learners' self-regulate as compared to the self-observation intervention. Furthermore, I hypothesized that observing oneself execute skills to the best of his/her ability would first influence the forethought phase by positively influencing self-efficacy beliefs, goal setting, and motivation. The forethought phase would then positively influence the actual overt performance of the skill. Finally, the observations of oneself performing to the best of his/her ability will most likely lead to greater feelings of self-satisfaction, these greater feelings of self-satisfaction will then influence the next forethought phase in subsequent performance attempts.

In addition to the various aforementioned self-regulatory processes, I proposed that there exists another psychological variable that may be involved in the self-modeling process, that of anxiety. The following section will describe the research that has investigated the impact of modeling on observers' anxiety levels. Furthermore, the potential influence of the self-as-a-model on learners' levels of anxiety will be discussed. It is possible that a learner's level of anxiety can influence all the phases of the self-regulation of learning and, consequently, anxiety is presented as influencing the larger circle that encloses the three self-regulatory phases (see Figure 3).

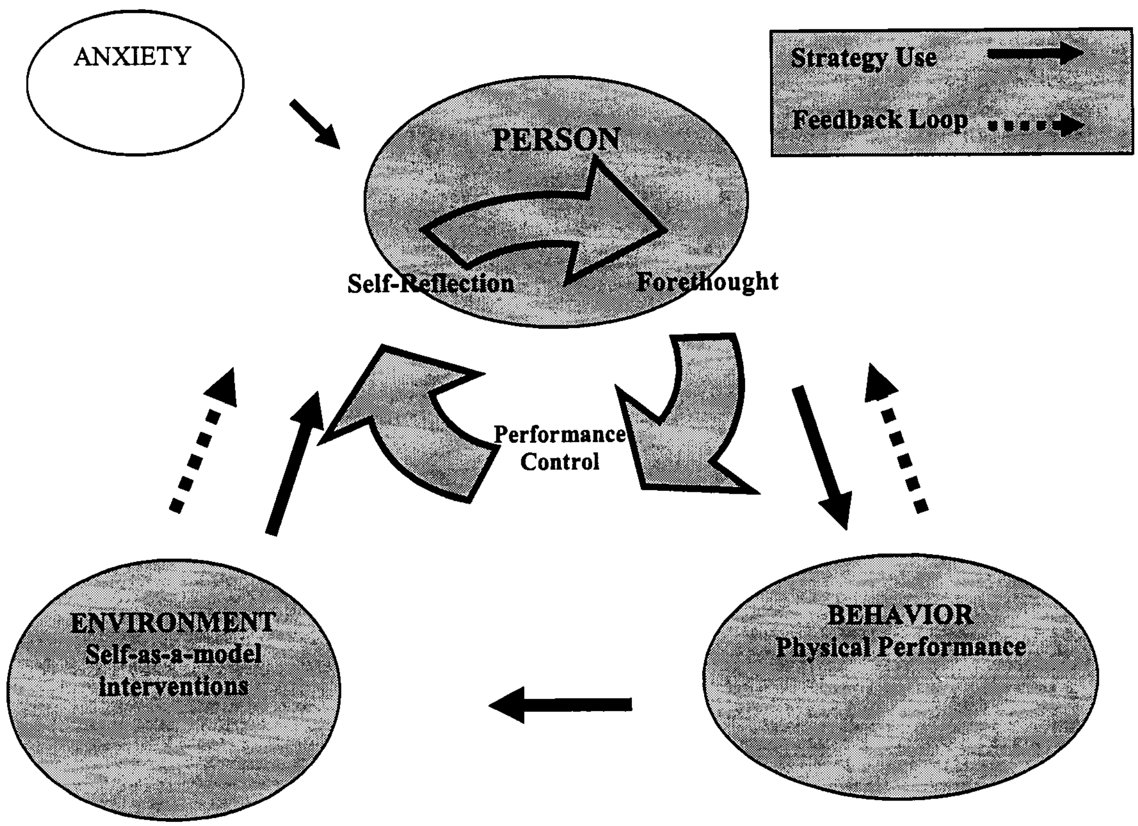

Figure 3. The influence of anxiety on the triadic forms of self-regulation. Note. From "A social cognitive view of self-regulated academic learning." By B. J. Zimmerman, 1989, *Journal of Educational Psychology, 81,* p. 330. Copyright © 1989 by the American Psychological Association. Adapted with permission.

Anxiety

Dowrick (1999) proposed that the level of a learner's arousal, specifically anxiety, may be involved in the self-modeling process. Anxiety is defined as the physical and sychological feelings associated with inaccurately assessing one's coping ability in a particular situation (Bandura, 1997). As the result of these feelings, an individual may not be able to convince him/herself to do something because they find it too threatening, even though the activity may offer many personal benefits. Bandura has examined extensively the anxiety that is associated with extreme phobic behavior, with some of these studies examining the impact of modeling. The rationale for employing a modeling intervention was that the model would convey information to the individual about the predictability and controllability of the threat (Bandura, Reese, & Adams, 1982). For example, the model would display how to cope in the threatening situation, and consequently the individual should be able to learn coping strategies from the model to manage the fear. Furthermore, Bandura (1997) posited that the more similar the model was perceived by the observer the more powerful the modeling intervention would be. This logic supports the use of a self-as-a-model in such situations. Bandura's research, however, has focused on the influence of other model types.

Bandura and Adams (1977), Bandura, Adams and Breyer, (1977) and Bandura et al. (1980) examined the influence of modeling on self-efficacy and coping strategies. To do this, the participants viewed a model perform the task that they were fearful or anxious towards and saw the model engage in appropriate coping strategies. The results indicated that viewing a model was more effective than no model at increasing the participants' use of coping strategies and self-efficacy beliefs. In addition, these studies supported the notion that anxiety and self-efficacy were linked because it was found that the higher the level of perceived self-efficacy, a greater number of coping strategies were learned (Bandura & Adams, 1977; Bandura, Adams & Breyer, 1977; Bandura et al., 1980).

Therefore, it is likely that self-efficacy mediates the impact of modeling on anxiety levels.

For the current research project I was interested in less extreme forms of anxiety. This anxiety, nevertheless, could still be a debilitating factor in motor skill performance. Dowrick (1999) posits that feelings of anxiety may be the limiting factor in a learner's behavior reproduction. Viewing oneself performing a skill without difficulty may reduce this limiting factor, as the learner would be able to see him/herself performing the skill with no indications of personal danger. This notion of anxiety has also been shown to hinder athletic pursuits (see Woodman & Hardy, 2001), however, very little research has examined the impact of self-modeling on anxiety in skill acquisition or the relationship between anxiety and other self-regulatory processes. In fact, Starek and McCullagh's (1999) study appears to be the only study to date to investigate this issue.

Summary

From this literature review, four main gaps present in the self-modeling research were identified. First, it is obvious that there is a lack of empirically based self-modeling experiments with large numbers of participants. Second, most self-as-a-model studies were performed in the clinical or classroom setting with very little data coming from a motor skill environment, decreasing the generalizability of these studies to motor skill learning, which was the interest of this research. Third, little of the experimentation has compared self-modeling to other modeling techniques (Starek & McCullagh, 1999). Finally, on several occasions researchers have called for increased investigation into the proposed psychological variables involved in self-as-a-model interventions, specifically self-regulatory processes and anxiety (e.g., Dowrick, 1999; Starek and McCullagh, 1999). Ultimately, the goal of a self-as-a-model intervention is to modify or improve performance. This performance improvement is hypothesized to be largely dependent on these psychological factors.

Given these factors, the three main objectives proposed for the current research are as follows. The first objective involved determining whether or not the self-modeling intervention results in improved skill performance, along with an increase in self-regulated learning and a decrease in anxiety levels, when compared to the self-observation and the control group. The second objective was to better delineate the relationships among the self-regulatory processes involved in self-as-a-model interventions, in order to determine how it improves performance. The final objective involved discovering what types of information the participants are attending to when they were watching their self-modeling and self-observation videotapes through a think-aloud protocol.

Developmental Modeling Issues

Investigation into developmental differences and modeling has been examined in the literature. The current study did not investigate developmental differences among the participants, as it was not the focus. I determined, however, that it was necessary to briefly review this literature in order to note that developmental differences in modeling do exist. From a theoretical perspective, Yando, Seitz, and Zigler (1978) stressed the importance of the observer's cognitive-developmental level and motivational orientation in modeling. Furthermore, Yando et al. proposed that older children have better developed memory storage and retrieval systems, the ability to discriminate task relevant cues, and more mature physical abilities, which all lead to the superior performance of modeled actions. Interestingly, these abilities translate to the first three processes involved in Bandura's (1977; 1986; 1997) social cognitive theory of modeling: attention, retention and motor reproduction.

A number of researchers have tested these notions. For example, Weiss (1983) compared 7 to 8 year olds with 4 to 5 year olds on a sequential movement task. The participants viewed either a silent model, a verbal model, or no model. Weiss discovered that the 7 to 8 year olds performed equally as well when they viewed a verbal or a silent model, however, the 4 to 5 year olds required a verbal model to learn the movement sequence. As a result, Weiss stated that a "show and tell" model is most helpful to younger children because of their undeveloped ability to attend to task relevant cues or use verbal rehearsal strategies to recall task instructions.

Weiss and Klint (1987) conducted a follow-up to Weiss' (1983) study. In their study, children 5 to 6 and 8 to 9 years old were assigned to a verbal rehearsal (model or no model), a verbal model only, or a no model condition. The results showed that regardless of age the children in the verbal rehearsal group (with a model or with no model) performed better on the movement sequence task than the verbal model only and the no model groups. Despite finding no age difference in this study, Weiss and Klint discovered through post-experiment interviews that the children in the two age groups recalled the order of the movement sequence in very different ways. It appeared that older children used some form of rehearsal, such as saying the order of skills out loud or grouping the skills, whereas, the younger children only rehearsed after their last trial with instructions was completed.

These aforementioned studies clearly show age related differences in modeling, specifically in terms of children's use of verbal rehearsal. Noteworthy is that children appear to mature in terms of selective attention, visual processing speed, and control processes (i.e., labeling, rehearsal, organization) when they reach the age of 12. (French & Thomas, 1987; Gallagher et al., 1996; McPherson, 1999; Nevett & French, 1997).

Research Design

In order to situate the research questions it is necessary to provide a brief overview of the current study's research design. The children recruited to participate in this study were randomly assigned to a self-modeling intervention and practice group, a self-observation intervention and practice group or a practice alone control group. All participants completed quantitative measures examining the self-regulatory processes of self-efficacy, motivation and self-satisfaction, as well as anxiety and physical performance. The think-aloud verbalizations and the goal setting measures were assessed qualitatively by requesting that the participants verbalize all thoughts and indicate their goals for each session.

As a result of the qualitative and quantitative components, this study was conducted using a mixed-methodology research design. This design provided the opportunity to expand the knowledge base on the processes involved in self-as-a-model interventions by adding scope and breadth to the study (Greene et al. 1989). The type of mixed-methodology design that was implemented is termed simultaneous triangulation as we have attempted to answer the qualitative and quantitative research questions at the same time in the study. Furthermore, the results of the qualitative questions are reported separately and are not used to verify the findings from the quantitative component (Creswell, 1994).

Research Questions and Hypotheses

From the previously mentioned objectives, the following three main research questions and hypotheses emerged.

1) What are children thinking about while viewing self-as-a-model videos? The results that would arise from the think-aloud data were unknown, as this type of data had not been collected before with children. I anticipated, however, that there would be differences between the thought processes verbalized by the children in the self-modeling group when compared to the children in the self-observation group and the control group.

2) What is the impact of self-modeling, self-observation and practice alone on children's swimming performance, anxiety levels, and self-regulation of learning? I hypothesized that the self-modeling group would demonstrate superior swimming performance, decreased anxiety levels, and indicate higher scores on the measures assessing the self-regulatory processes (stronger self-efficacy beliefs, greater intrinsic motivation, and greater self-satisfaction) as compared to both the self-observation and the control groups. Furthermore, I anticipated that the self-observation group would demonstrate superior swimming performance and indicate higher scores on the measures evaluating the self-regulatory processes as compared to the control group. Due to the lack of research in the area, no specific hypotheses were set for the goal setting measure.

3) What is the strength of the relationship among: a) the intervention and the dependent variables, b) physical performance and the self-regulatory processes, and c) among the self-regulatory processes? a) I hypothesized that the intervention would be strongly correlated with all dependent variables because the self-as-a-model interventions were anticipated to influence the dependent variables in a positive direction, b) I anticipated that physical performance would show a strong relationship with all self-regulatory processes because of the proposed relationship between increased self-regulation and superior physical performance, and c) the self-as-a-model interventions should have a positive impact on all measured self-regulatory processes, therefore, the self-regulatory process should all be highly correlated.

Thesis Format

This section contains a brief preamble to explaining the format for the remaining four chapters of the thesis document. Although this thesis is the product of one main research program, the findings that emerged warranted their description in three separate chapters. After analysing the data, it became apparent that in order to treat the data in the most effective manner the qualitative and quantitative components would be best described separately. The rationale for this is that it allowed for focused and relevant literature reviews and discussion sections that were specific to the research questions posed. As a result, the majority findings were presented in two articles, which are found in chapters two and three. Chapter two contains the results stemming from the quantitative measures. Specifically, chapter two reports on the majority of the psychological variables, as well as the physical performance variables, in the form of a manuscript. Following this, in chapter three, a manuscript containing the results from the think-aloud data are presented. Finally, chapter four consists of a results and discussion for the two remaining psychological measures that were not described in the two articles.

The justification for placing the article that examined the quantitative measures before the article with the qualitative measures is that, to date, the majority of self-as-a-model research has been conducted from a positivist framework. I believed that by beginning the thesis with the article involving the quantitative data, it would provide strong support for branching out and attempting to incorporate qualitative data into the field of self-as-a-model interventions. Finally, by discussing the measures of anxiety and goal setting following the two articles, I anticipated that the exclusion of these measures from the previous articles would become evident.

The concluding chapter of the thesis document consists of an elaborated discussion in order to illustrate the links between each chapter's findings and to summarize and conclude the overall dissertation findings.

Presentation of the Manuscripts

The following two chapters contain the manuscripts to be published. The manuscript entitled "Investigating the impact of self-as-a-model interventions on children's self-regulation of learning and swimming performance" will be submitted for publication in a, yet to be determined, reputable journal within the field of educational psychology. For this article I am the principal investigator with Dr. Diane Ste-Marie (thesis supervisor) as the co-author. The manuscript entitled "The cognitive processes underlying self-modeling and self-observation: What are children thinking about?" has been submitted for review with the journal *Sport and Exercise Psychology*. I am the principal investigator and Dr. Diane Ste-Marie and Dr. Rose Martini are co-authors for this article. For further information please refer to the Contributions of Collaborators section in Appendix A.

CHAPTER 2- Article 1

Investigating the impact of self-as-a-model interventions on children's

self-regulation of learning and swimming performance

Abstract

This study compared the impact of a self-modeling intervention (viewing oneself perform an adaptive behavior) and practice, a self-observation intervention (viewing oneself perform at current skill level) and practice or practice alone on children's self-regulation of learning and swimming performance. Operating within Zimmerman's (1989, 2000) theory of self-regulated learning, we examined three self-regulatory processes (self-efficacy, motivation, self-satisfaction), as well as physical performance. We randomly assigned thirty-three children, between the ages of six and ten, to a self-modeling group, a self-observation group or a control group. A series of one-way ANOVA analyses with the retention scores revealed a significant difference among groups for all dependent measures. Post hoc testing showed consistently that the self-modeling group obtained superior scores as compared to both the self-observation group and the control group, with these two groups performing similarly. Furthermore, correlation analyses indicated a strong relationship between the type of intervention and all the dependent variables. In addition, strong relationships were evident among all self-regulatory processes and these processes were also highly correlated with physical performance. These results provide support for the implementation of self-modeling interventions with children learning motor skills.

The mastery of complex motor skills requires that individuals take control of their learning process, that is, to self-regulate their learning. According to the social cognitive perspective, self-regulation in learning refers to the "self-generated thoughts, feelings and actions that are systematically designed to influence one's acquisition of knowledge and skill" (Schunk, 2001, p. 125). Researchers have proposed that a number of key processes are involved in the process of becoming a self-regulated learner such as, self-efficacy, motivation, self-satisfaction, and goal orientation (e.g., Zimmerman, 2000). On numerous occasions, researchers have suggested that exposure to social modeling can influence these processes (McCullagh & Weiss, 2001; Schunk, 2001; Zimmerman, 1989, 2000). Modeling refers to the process whereby learners pattern their behaviors, strategies, thoughts, beliefs, and affects after having observed another (Bandura, 1977, 1986, 1997). Evidently, modeling serves both motivational and informational functions and, therefore, is an important technique for transmitting self-regulatory skills to learners (Schunk & Zimmerman, 1997).

In this current research, we examined how a specific type of model, known as the self-as-a-model, influenced the processes involved in the self-regulation of learning. A self-as-a-model intervention involves individuals viewing themselves, generally on video, performing a skill they are attempting to learn. Teachers commonly use modeling interventions (both other modeling and the self-as-a-model) to teach both physical and cognitive skills (see McCullagh & Weiss, 2001 for a review). Researchers have suggested that viewing the self-as-a-model, as opposed to viewing others may be the most effective form of modeling for a number of reasons, most of which are associated with model similarity. For example, McCullagh (1986) and Hebert and Landin (1994) found that the more similar the observer perceives the model, the more effective the modeling intervention.

Bandura's (1977, 1986, 1997) social cognitive theory of modeling can explain the effectiveness of the self-as-a-model as a teaching technique. Briefly, Bandura proposes that the modeling process consists of four sub-processes (attention, retention, motor reproduction, and motivation) that together determine the extent to which observers learn from a model. According to Bandura, the most significant sub-process is attention. It involves the observer attending to the model with the purpose of gathering appropriate information about skill performance. The learners retain the skill information in the form of a cognitive representation (retention sub-processes), which they use when attempting to reproduce the skill (behavior reproduction sub-process). The final sub-process in Bandura's theory, motivation, can positively or negatively influence the above sub-processes. For example, if learners are not motivated to learn a skill, they will pay little attention to the demonstration and this will influence the development of a cognitive representation and the behavior reproduction of the skill. We put forth that viewing oneself on video is extremely motivating and has a powerful positive impact on the amount of attention that paid to the modeled demonstration.

We were interested in comparing the two main types of self-as-a-model interventions, self-modeling and self-observation. A self-modeling intervention is a process that involves videotaping learners while they are performing a skill they are attempting to learn. Instructors would then edit the video in order to remove all obvious error performances (Dowrick, 1999). The resulting self-modeling video that instructors show to learners would only contain their best performances of the skill. Alternatively, the self-observation intervention involves capturing video footage of the learners; however, in this case the instructors would not edit the video. Thus, allowing learners to view themselves performing at their current skill level with obvious errors included (Dowrick, 1999).

Researchers interested in self-modeling and self-observation have conducted the majority of their work with cognitive and behavioral skills (see Dowrick, 1999 for a review). Nonetheless, a limited number of studies have also investigated the impact of these interventions in the motor skill environment. Researchers have employed self-modeling interventions with disabled children learning both swimming skills (Dowrick & Dove, 1980) and everyday skills (Dowrick & Raeburn, 1995), as well as with able-bodied adults learning sport specific skills such as volleyball (Ram & McCullagh, 2003), swimming (Starek & McCullagh, 1999), and gymnastics (Winfrey & Weeks, 1993). The majority of these studies evaluated the effectiveness of self-modeling interventions at improving physical skill performance and raising self-efficacy beliefs.

The results, in terms of the benefits of the self-modeling interventions on skill performance, were somewhat unclear, with some studies showing physical performance benefits (e.g., Dowrick & Raeburn, 1995; Starek & McCullagh, 1999), but others not showing any (e.g., Winfrey & Weeks, 1993). These varied results support continued research on this technique. A more consistent finding in the research, though, was that the self-modeling interventions did appear to increase learners' self-efficacy beliefs. Similar to self-modeling, a limited number of studies examined self-observation with motor skills (e.g., Laguna, 1996; Zetou, Fragouli & Tzetzis, 1999). The standard finding with these studies is that the self-observation intervention was more beneficial than no model for improving skill performance and self-efficacy beliefs.

To date, researchers have only examined self-modeling and self-observation interventions individually, and have yet to compare their relative effectiveness. It is possible to formulate several arguments to explain why each intervention may be superior. For example, Dowrick (1999) proposed that self-modeling is most effective because of the increase in cognitions and emotions that occur as a result of viewing oneself perform at a level of consistency that has not yet been accomplished. Alternatively, one could argue that self-observation is more effective because learners are able to view themselves performing at their current skill level and, thus, will be more effective at determining their errors in their current performance and apply this to their next performance attempt (Bandura, 1986). As a result, a comparison of these two techniques could provide us with concrete information about the effectiveness of each intervention and enable us to determine which intervention is most beneficial.

Even though research has examined the impact of self-modeling and self-observation interventions on certain psychological variables related to self-regulation, they have not investigated these interventions within a framework of self-regulated learning. Numerous researchers have suggested this as a fruitful area for future work (e.g., Dowrick, 1999; Starek & McCullagh, 1999). For that reason, we adopted Zimmerman's (1989, 2000) triadic analysis of self-regulatory functioning as the conceptual framework for this research (see Figure 4). This diagram is valuable for illustrating how we propose that self-as-a-model interventions will influence self-regulatory processes and physical performance. For instance, it is our belief that the environmental impact of self-as-a-model interventions will influence a person's self-regulation of learning and that the various processes involved in the self-regulation of learning will then influence physical performance outcomes. This theory is cyclical and, as a result, physical performance outcomes in turn influence the subsequent self-as-a-model intervention.

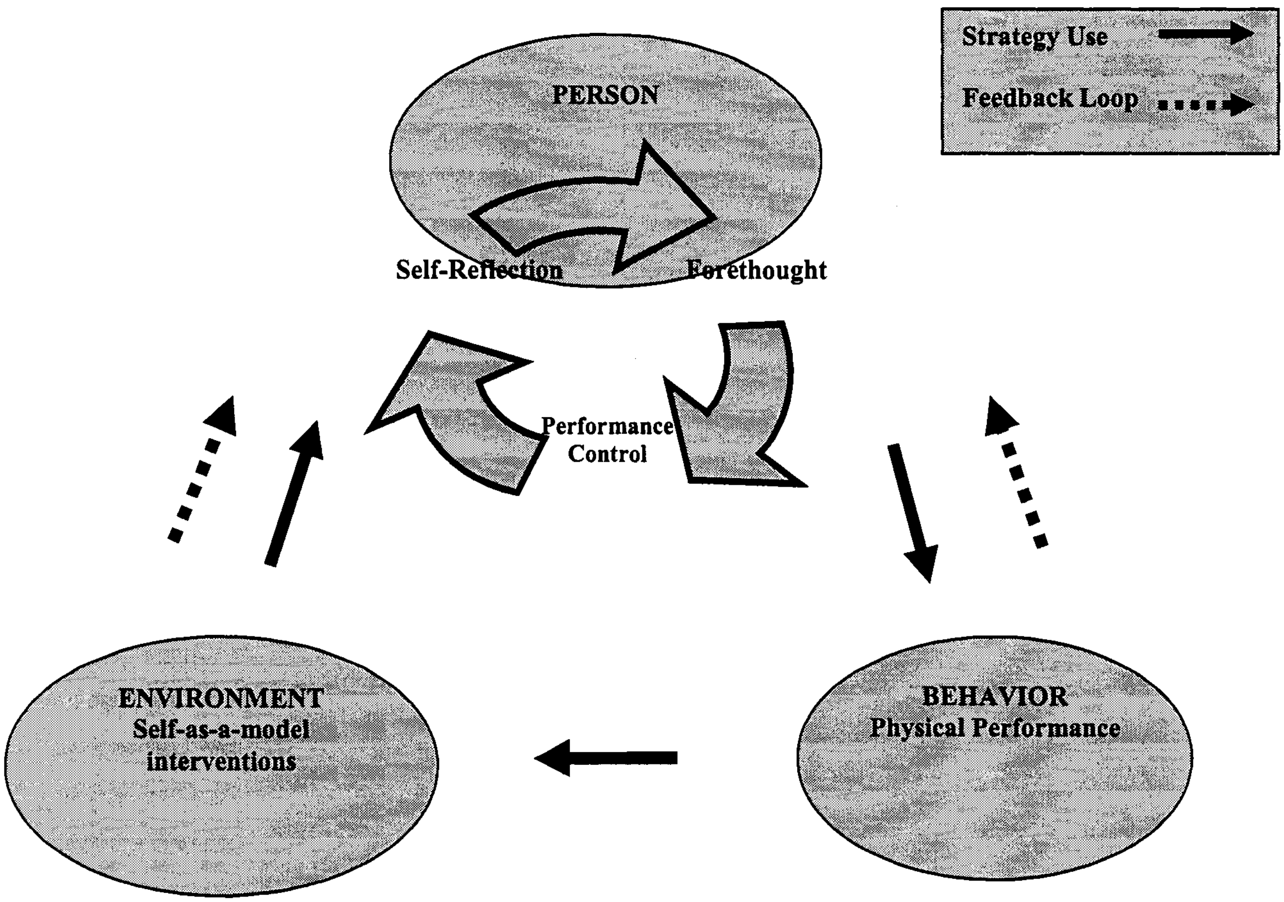

Figure 4. Triadic forms of self-regulation. Note. From "A social cognitive view of self-regulated academic learning." By B. J. Zimmerman, 1989, *Journal of Educational Psychology, 81,* p. 330. Copyright © 1989 by the American Psychological Association. Adapted with permission.

Within the self-component of the triadic definition of self-regulation, Zimmerman (1989, 2000) describes a cyclical theory of the self-regulatory processes involved in learning (Figure 4). The first phase, the forethought phase, includes all thought processes that occur before a skill is attempted. This phase consists of two categories. One of the categories is task analysis, which refers to the setting of goals and the strategies employed by learners to master a skill. The second category of the forethought phase is self-motivational beliefs, consisting of self-efficacy beliefs, outcome expectations, intrinsic interest, and goal orientation. Bandura (1997) has proposed that similar models, as perceived by learners, will influence learners' beliefs in their competency to perform skills (self-efficacy) and their intrinsic motivation[1] towards learning the skill. Kitsantas, Zimmerman & Cleary (2000) demonstrated this in their study that compared coping models (a model that is learning to perform the skill and improvement is obvious) and mastery models (a model that has already mastered the skill). They found that the model type perceived as most similar to the learners, the coping model, was superior to the mastery model at improving dart throwing skills, raising self-efficacy beliefs, and intrinsic interest towards the task.

According to Zimmerman (1989, 2000), the next phase in the self-regulation of learning, is performance control. This phase encompasses all the processes that occur during the actual reproduction of the physical skill. The two categories in this phase are self-control and self-observation. Self-control consists of the processes that assist learners in focusing on the task and optimizing their performance attempts; including such processes as imagery and attentional focusing. By introducing a self-as-a-model intervention, we believed that this promoted learners to pay more attention to their skill performance attempts because they were aware that they would be viewing themselves

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[1] It appears that the self-regulation literature uses the terms intrinsic interest and intrinsic motivation interchangeably.

afterwards on video. Furthermore, viewing a model aids in the development of a mental image of the skill, which Bandura (1977, 1986, 1997) noted as beneficial in the learning process. This leads to the self-observation category of the performance control phase. At this point, learners are involved in tracking specific aspects of their performance attempts and the outcomes of the attempts. It is likely that viewing the self-as-a-model will enhance this process, as modeling is known to develop error detection and correction mechanisms in learners (Bandura, 1977, 1986, 1997).

Finally, the self-regulation of learning process consists of the self-reflection phase, which takes place following each performance attempt. This phase consists of the learners' self-reactions. In order to make a self-judgment, learners generally evaluate their performance attempts and decide if they are content with their progress. Specifically, this is the degree to which learners are satisfied with their performance attempts. This degree of self-satisfaction is believed to influence learners' forethought phase in the next performance attempt, thus, illustrating the cyclical nature of Zimmerman's (1989, 2000) self-regulated learning. Similar to the other two phases, we proposed that a self-as-a-model intervention would influence learner's degree of satisfaction with their performance attempts.

In sum, the first purpose of the current research was to assess the impact of self-modeling and self-observation interventions on children's self-regulation of learning and swimming performance. To this end, we chose to investigate the self-regulatory mechanisms of self-efficacy, motivation, and self-satisfaction. We were also interested in examining physical performance and, as a result, we measured this variable using two distinct techniques. First, we evaluated physical performance using a scale in order to give each participant a score. Second, we administered a recognition test. Other researchers have recommended including a recognition test in motor skill learning research in order to gain a greater understanding of the extent of the participants' knowledge regarding the skills they were learning (McCullagh & Weiss, 2001). For example, even though the participants may not be able to physically perform the skills perfectly they may, however, have developed a correct cognitive representation of the skill.

Therefore, based on the literature, we formulated two hypotheses for the first purpose. First, we predicted that the self-modeling group would outperform the self-observation group and the control group on all measures. This is anticipated because learners who viewed themselves perform to the best of their ability should indicate increased self-efficacy beliefs, intrinsic motivation, and self-satisfaction, which will then have a positive impact on physical performance. Second, we estimated that a self-observation intervention would positively influence the mechanisms involved in the self-regulation of learning and physical performance when compared to a practice only control group. This was expected because viewing oneself perform (with or without errors) should be more valuable than practice alone

The second purpose was to assess the strength of the relationships between the variables through correlation methods. Originally, we desired to test the mediating relationship between the variables, however, our sample size did not allow for this type of analyses. In the end, correlation analyses provided us with the strength of the relationships among the variables. First, we evaluated the strength of the relationship between the interventions and all dependent measures; a strong correlation was expected.

Second, we anticipated that a strong relationship would exist between physical performance and the other dependent variables. Finally, we expected a strong relationship among the self-regulatory processes due to the cyclical nature of Zimmerman's (1989, 2000) theory of self-regulated learning.

Method

Participants

Thirty-three children (20 female and 13 male) between the ages of 6 and 10 years old ($M = 8.3$, $SD = 1.2$) participated in this study. To recruit these children we approached a local summer camp program (convenience sampling) and recruited through word of mouth (snowball sampling). Before participating in the study, both the children and the parents provided informed consent. No attrition occurred as all children who initiated participation in the study continued their participation for the duration of the study.

Materials

A JVC video camera (GR-D200U) was used to videotape each child. Depending on the participant's experimental group assignment, a self-modeling, a self-observation, or a control video was created using Microsoft Movie Maker software program (2001). We edited the self-modeling videos so that they only showed clips of each participant's correct performance attempts of the skill. The self-modeling videotapes were edited in such a way that it seemed as though the learners were swimming for a distance of 10 m continuously, while performing the skill to the best of their ability (errors were edited out). We did not edit the self-observation videos; therefore, the participants viewed themselves performing the skill at their current skill level, with errors included. Each clip was approximately 15 seconds in length, which was roughly the duration it took the participants to complete a 10 m swim. This same clip was then repeated four times to create a vignette that was approximately 60 seconds in length. During the course of the experiment, we constructed new videos so that the participants in the self-modeling group were always able to view their most adaptive behaviors and those in the self-observation group were able to view themselves improving. Dowrick (1999) and Winfrey and Weeks (1993) have deemed this technique important, as they showed that self-as-a-model interventions negatively influenced participants when they were unable to view themselves improving.

The control group participants did not view a video of themselves swimming. Instead, we created six-60 second video clips from the movie *Shrek* (one for each intervention day). A 15-inch screen of a Dell Inspiron 2600 lap top computer displayed all video footage.

Measures

Physical Performance. Physical performance was measured by generating a scoring procedure based on specific criteria from the Canadian Red Cross Water Safety Program Standards (1996). Ten certified swimming instructors reviewed the scoring sheets that we developed for each swimming stroke. These swimming instructors commented on the content, as well as, the rating scale. Using the suggestions from the swimming instructors, we constructed the final scoring sheets. Two expert swimming instructors, who were blind to the experimental groups, evaluated each participant's swimming trials using the 14-item scale. Each item on the scale was scored as a 0 (not completed), a 1 (completed at least once), a 2 (completed at least three times) or a 3 (completed all the time). Therefore, the maximum score a participant could have received on any stroke was 42. Inter-rater reliability between the two raters was confirmed at 0.92 by a Pearson's correlation.

Recognition Test. We also measured physical performance through a recognition test. In this phase, two different clips of the participants performing the swimming skill were constructed. One clip consisted of the children performing the skill to the best of their ability, whereas, the other clip contained them performing the skill with obvious errors. For the error clip, the children were asked to identify whether or not they thought the swimming performance was done well or if it had mistakes. If the children indicated that they felt the clip had mistakes, then we recorded their response as correct, whereas, if they indicated it was acceptable then we scored their response as incorrect. If the participant correctly identified the error clip as containing errors then we asked the children to indicate what mistakes they saw. Each recognition error performance clip consisted of four errors; one-point was awarded for correctly identifying each error. This was then converted into a percentage. For example, if the participant correctly identified three of the four errors, we recorded it at 75% correct. For the best of their ability clip, we evaluated the participant's ability to correctly identify the clip as such. If the children indicated that they felt it was acceptable, then we recorded their response as correct, whereas, if they indicated it was unacceptable then we scored their response as incorrect.

Motivation to Swim Index. Pilot data had suggested that it was important that the children have fairly high general motivation levels towards learning the swimming stroke selected for the study. Thus, we developed a single-item questionnaire to ensure that the children were sufficiently motivated to learn the swimming skill. We provided a 10-point

Likert scale, where one meant it was not important at all and 10 meant it was very important.

Self-Efficacy. Bandura (1997) recommends measuring both the strength and level of self-efficacy beliefs; however, researchers have suggested that this format may be too difficult for children less than nine years of age to understand (Chase, Ewing, Lirgg, & George, 1994; Lirgg & Feltz, 1991). The measure we used to rate the children's self-efficacy beliefs was borrowed from Chase (1997, as illustrated in Feltz and Chase, 1998) and consisted of five circles ranging in size from small, representative of low feelings of self-efficacy, to progressively larger circles, representing greater feelings of self-efficacy. Above the circles were the numbers 1-10. Researchers have shown this to be effective with children (Chase, 1997; Clark & Ste-Marie, 2002).

MOSS-Challenge Sub-Scale. To assess the children's motivational orientation, we administered the revised Motivation Orientation in Sport Scale (MOSS, Weiss, Bredemeier & Shewchuk, 1985. Weiss et al. designed this scale for use specifically with children. The scale contained five motivational orientation sub-scales: (a) challenge, (b) curiosity, (c) mastery, (d) judgment, and (e) criteria. Similar to other studies (Brustad, 1988; Smith, 1999), we only administered the challenge sub-scale in the current study. This sub-scale consisted of five items that measured children's intrinsic and extrinsic motivation by assessing their preference for challenging skills versus preference for easy skills. The challenge sub-scale has demonstrated acceptable internal consistency with a Chronbach's alpha of .81 (Weiss et al. 1985). Each of the five items in the sub-scale contained two statements (one referring to being intrinsically motivated and the other to being extrinsically motivated). For example, one item consisted of the following two statements, “Some kids like hard swimming skills because they’re a challenge BUT other kids prefer easy swimming skills that they are sure they can do.” The children selected one of the two statements as being most like them and subsequently they evaluated the selected statement as being “sort of true” or “really true” for them. The items were then scored on a four-point ordinal scale with the anchorings 1 (extrinsic orientation) to 4 (intrinsic orientation). The total score for the MOSS-challenge sub-scale was determined by calculating a sum of the scores given for each item, therefore, the highest possible score was 20.

Self-Satisfaction. In order to measure a component of the participants’ self-reactions, we constructed a scale based on the measure used in a series of experiments by Zimmerman and Kitsantas (1997, 1996). This measure comprised of a satisfaction rating on a scale from 1 to 10 in 1 unit intervals. In order to direct the children’s attention towards the meaning of the numbers, “happy faces” displaying various emotions were placed at the following points: 1 ☹(not satisfied), 4 😐(somewhat satisfied), 7 🙂 (pretty satisfied) and 10 ☺ (very satisfied).

Procedures

The research described here was part of a larger study on the modeling techniques of self-modeling and self-observation[2]. For the purposes of this current paper, we will emphasize the aspects related to the self-regulatory mechanisms and physical performance measures. Prior to the first session of the study, we randomly assigned the children to an experimental group and took measures to ensure that we evenly distributed

[2] The present research also contained a think-aloud component. In addition, anxiety and goal setting were also measured.

the ages and gender of the children across the three experimental groups (refer to Table 1).

Table 1

Participant Distribution among the Three Experimental Groups for Age and Gender

	Experimental Group		
	Self-Modeling N = 11	Self-Observation N = 11	Control N = 11
Age			
6	1	1	1
7	2	3	2
8	3	2	3
9	2	2	2
10	3	3	3
Gender			
Male	4	4	5
Female	7	7	6

This study took place over eight days and consisted of three phases: the pre-test, the intervention, and retention phases.

Pre-test Phase. For the first phase of the experimental protocol, the swimming instructor asked the children to attempt to perform a series of swimming skills selected from the Aquaquest Canadian Red Cross Water Safety Program (1995) guidelines. In order to determine the swimming skills that each child would perform, the children first informed the swimming instructor of the Aquaquest level that they had most recently completed. The participants then attempted to perform swimming skills from the next highest Aquaquest level. From the children's performance of these skills, one skill was chosen based on the following two criteria: (1) the participants had to demonstrate the stroke being performed correctly at least once, but no more than two times, over a 10m swim; this was evaluated by a certified swimming instructor (2) they indicated they were motivated to learn the swimming skill. This second aspect was ascertained by posing the question "how important is it to you that you learn how to do (the selected swimming skill) correctly?" The swimming instructor asked the children to say out loud a number on the one to 10 Likert scale of the motivation to swim index. The swimming skill was selected if the motivation to swim index indicated a score of greater than six[3].

Once the swimming skill was chosen, participants were asked to respond to the self-efficacy scale and MOSS-challenge sub-scale. For the self-efficacy scale, participants selected a number on the 10-point Likert scale that best described how good they felt about being able to do the swimming stroke correctly. To assist them, the children were directed to use the circles below the numbers to recognize that a higher number referred to greater self-efficacy beliefs. For the MOSS – challenge sub-scale, children responded to the five items found in this sub-scale. The instructor read the statements to the children and asked them to decide which of the two statements was most like them (one statement suggested intrinsic motivation and the other extrinsic motivation). Next, we asked the children if the statement they selected was "really true" or just "sort of true" for them. All measures were administered on the pool deck.

Following this, the instructor asked the participants to swim the selected skill to the best of their ability for a 10 m distance. While the children performed the chosen skill, a researcher filmed from the side angle, while standing on the pool deck, no more than 5 m away from the participant. While the participants were swimming, the researcher walked along the pool deck to ensure that a side-filming angle was maintained. Furthermore, the zoom function on the camera was used to ensure that the video

[3] If they had responded with a score lower than 6, another swimming skill would have been chosen, however, this situation did not occur.

contained only the participant and no other environmental details, in order to minimize distractions.

After this session, the chosen swimming skill was transferred to video compact discs (CD's), in order to construct the self-modeling and self-observation footage. It is important to note that the swimming skills chosen differed among the children, but we believed this to be worthwhile in order to ensure that they fulfilled the two aforementioned criteria (skill performance was initially inconsistent and poor; children were motivated to learn the skill). As a result, children received instruction on one of the following five swimming skills in the present study; front crawl (n = 13), back crawl (n =6), breaststroke (n = 10), elementary backstroke (n = 2), and butterfly (n = 2) (see Table 2).

Table 2

Breakdown of Swimming Strokes by Group

	Experimental Group		
	Self-Modeling N = 11	Self-Observation N = 11	Control N = 11
Stroke (skill level)			
Front Crawl	5	5	5
Back Crawl	1	1	1
Breaststroke	4	4	4
Elementary Backstroke	1	0	
Butterfly	1	1	0

Intervention Phase. Across six consecutive days, following the pre-test phase, each child participated in six swimming lessons, each lasting approximately 30-minutes (the duration of a regular Red Cross swimming lesson). Before the beginning of each of the swimming lessons, the children were first shown his/her self-modeling video, self-observation video, or control group video. While viewing the video, the children sat directly in front of the computer screen, approximately 40 cm away from the screen. Each child viewed their respective videotape individually, no other participants were permitted to watch. The self-modeling and self-observation videos consisted of four-15 second clips of the swimming stroke chosen for the experiment. While viewing the self-modeling and self-observation videos, the participants engaged in a think-aloud protocol, where we asked them to verbalize all thoughts[4]. During two of the six swimming lessons, the participants completed the self-efficacy scale and the MOSS-challenge sub-scale using the same procedure as the pre-test. We randomly assigned half of the participants to completing the questionnaires on the second and fifth sessions, while the remaining half completed the questionnaires on the third and sixth sessions.

Subsequent to this, the children engaged in a swimming lesson with a certified swimming instructor that was specific to the experimental swimming stroke identified. The children participated in the swimming lessons in groups of two or three[5]. Although, in pairs or triads, the instruction was always one-on-one as the children would complete a swimming trial and receive feedback before the next child went. The swimming instructor provided verbal feedback to each participant on skill execution and followed a feedback schedule where she gave the participants one positive feedback and one corrective feedback comment after each 10m swim. This ensured that all participants

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[4] The results from this component of the study are not discussed in this article.

[5] When the participants were in groups of two or three, the practice was structured such that limited observation of the other children was possible. As well, it was ensured that they did not watch the other children swim or hear the feedback given to the other participants by the instructor.

received similar feedback. In addition, the instructor was also responsible for ensuring that they allotted the same amount of practice time for each child.

At the end of each swim lesson, we asked the children to perform the swimming stroke to the best of their ability for a 10m distance. This performance was used to update the self-modeling and self-observation videos throughout the experiment, as well as for evaluation of physical performance. Finally, the last component of each intervention phase involved administering the self-satisfaction scale[6]. For the self-satisfaction scale, the children were shown the 10-point Likert scale and posed the question, "how satisfied are you with your performance of the (selected swimming skill) today?" The researcher then circled the participant's response.

At the completion of the third or fourth intervention sessions, using random assignment, the children completed a recognition test. For the recognition test, the participants viewed the two clips and for each clip decided if they performed the skill adequately or if it had errors. If the participants indicated that they performed the skill with errors then we asked them to elaborate and indicate what errors they made.

Retention Phase. Twenty-four hours after the last intervention phase, we administered the retention test. This retention test involved, (1) the completion of the self-efficacy and MOSS-challenge sub-scale, (2) a 10 m swimming performance of the selected skill, this was again videotaped, (3) completion of the self-satisfaction scale and, (4) the administration of the recognition test.

[6] The self-satisfaction scale was administered after each intervention session, however, the results from only two of the intervention sessions were randomly chosen to be entered into the data collection.

Data Analysis

Prior to conducting the following analyses, preliminary analyses confirmed that there were no differences in terms of gender or selected swimming stroke for any of the variables. For the acquisition phase results, we analyzed each dependent variable by computing four separate 3 (Group) X 3 (Session) ANOVAs with repeated measures on the last factor. We analyzed retention scores by four separate one-way ANOVA's for each of the dependent variables. For the recognition data, two separate 3 (Group) X 2 (Session) one-way ANOVA' s with repeated measures on the last factor were computed, one for the dependent measure related to whether the performance was adequate or had errors; and the other for the percentage correct for detecting errors. Due to the number of variables, we applied a Bonferonni adjustment (Tabachnick & Fidell, 2001) to the alpha level, resulting in an alpha level of .02 for all tests of significance.

Separate ANOVAs, rather than MANOVAs, were calculated because according to Huberty and Morris (1989), this should be done when the variables examined are conceptually distinct, when the research is exploratory, and if the variables under question have been investigated previously using univariate analysis. Given that this was the case for the dependent variables in the current study, separate ANOVAs were computed. In order to assess the direction of group differences, Tukey post hoc tests were computed. Effect sizes are reported as partial eta squared (η^2).

Correlation analyses were performed to assess the relationships between the independent variable and the dependent variables. Similar to the procedure, used by Zimmerman & Kitsantas (1997), the experimental groups were first assigned a numerical value according to their hypothesized effectiveness. Therefore, the control group was given a 0, the self-observation group a 1, and the self-modeling group was accorded a 2. This, along with the results from the self-regulatory processes and physical performance, were entered into a Pearson's correlation analysis.

Results

Physical Performance

The statistical difference between the experimental groups' pre-test performance scores were not significantly different, therefore, the participants' actual performance scores were used in the analysis. The acquisition scores indicated that overall the participants' swimming skills improved across sessions, as there was a main effect for Session, $F\ (2{,}60) = 49, p = .001,\ \eta^2 = .5$. Furthermore, there was a main effect for Group, $F\ (2{,}30) = 4.4, p = .02,\ \eta^2 = .3$. Tukey post hoc testing indicated that the self-modeling group's performance of the swimming skill surpassed both the self-observation and control groups in the acquisition phase, yet the self-observation and control group were not different from one another (see Table 3). The analysis for the retention phase physical performance scores also revealed a main effect for Group, $F\ (2{,}30) = 9.4, p = .001,\ \eta^2 = .4$. Tukey post hoc testing revealed that the self-modeling group's swimming skills were superior to both the self-observation and control groups; however, the control and self-observation groups' scores were not different from one another (see Table 4).

Recognition Test

The recognition test results are separated into three components. First, there was the correct recognition swimming clip, where the children were displayed performing the swimming skills adequately. The results showed that there were no differences between experimental groups in terms of the children's ability to identify that the recognition performance they viewed was performed adequately (self-modeling = 60%, self-observation = 61%, control = 57%). Second, the participants' ability to correctly identify that the error recognition clip contained errors also did not differ among experimental groups, with the level of accuracy across the groups being 60% (*SD* = .3) for self-modeling, 58 % (*SD* = .3) for the self-observation group and 57% (*SD* = .35) for the control group. Finally, when the children correctly identified a recognition clip as containing errors they were also asked to identify all the errors that they observed, out of a possible four errors. The findings indicated that the level of accuracy for error detection did not differ among the experimental groups (self-modeling = 43% (*SD* =.38), self-observation = 37% (*SD* = .38) and control = 43% (*SD* = .43).

Self-Efficacy

The self-efficacy scores in the acquisition phase showed a main effect for Session, $F\,(2,60) = 9.7, p = .01, \eta^2 = .2$. The Tukey post hoc test revealed that overall the participants' self-efficacy beliefs increased across sessions. There was no main effect for group and no interactions (see Table 3). For the retention phase, a marginal level of significance for Group was observed, $F\,(2,30) = 3.8, p = .03, \eta^2 = .2$, with the post hoc testing showing that the self-modeling group indicated higher self-efficacy beliefs towards the swimming skills as compared to both the self-observation and control groups, which were not significantly different from each other (Table 4).

MOSS-Challenge Sub-Scale

The findings from the repeated measures ANOVA with the MOSS-challenge sub-scale scores for the acquisition phase indicated no main effects for Group or Session (see Table 3). In contrast, the ANOVA for the retention phase revealed a main effect for

Group, $F(2,30) = 14.7, p = .0001, \eta^2 = .5$. Post hoc tests showed that the self-modeling group was more intrinsically motivated than both the self-observation and control groups. Again, the self-observation and control group were not significantly different from each other (see Table 4).

Self-Satisfaction

Acquisition phase analysis of the self-satisfaction scores showed no significant differences for Group or Session (see Table 3). The retention analysis, however, revealed a main effect for Group, $F(2, 30) = 8.9, p = .001, \eta^2 = .4$. Tukey post hoc testing discerned that the self-modeling group reported higher levels of self-satisfaction with their swimming performance as compared to both the self-observation and control groups. The self-observation and control groups' self-satisfaction scores were not significantly different (see Table 4).

Table 3

Means and Standard Deviations for the Dependent Variables for the Pre-Test, Mid-session 1 (MS1), and Mid-session 2 (MS2)

	Self-Modeling n=11			Self-Observation n=11			Control n=11		
Dependent Variables	Pre-Test	MS1	MS2	Pre-Test	MS1	MS2	Pre-Test	MS1	MS2
Swimming									
M	18.8	28.0	31.0	14.2	21.1	21.2	14.0	21.0	21.0
SD	5.4	4.1	5.0	8.0	8.7	8.6	7.0	7.9	8.3
Self-Satisfaction									
M	8.1	8.3	8.8	7.7	8.4	7.6	7.4	7.5	7.5
SD	1.2	1.3	0.9	2.5	1.6	2.0	1.0	1.4	1.1
Motivation									
M	13.9	15.5	15.5	13.2	13.3	12.2	12.7	12.3	12.0
SD	4.4	4.2	4.1	3.1	4.4	4.4	2.5	2.6	3.5
Self-Efficacy									
M	6.5	8.0	8.7	6.6	7.5	8.1	7.2	7.9	8.0
SD	2.8	1.5	1.0	2.3	1.5	1.5	1.5	1.1	1.1

Table 4

Retention Session Means and Standard Deviations for the Dependent Variables

Dependent Variables	Self-Modeling n=11	Self-Observation n=11	Control n=11
Swimming			
M	32.0	20.5	18.9
SD	5.7	9.7	7.3
Self-Satisfaction			
M	9.7	8.5	7.8
SD	0.5	1.2	1.2
Motivation			
M	19.0	14.2	10.3
SD	3.5	5.0	2.4
Self-Efficacy			
M	9.4	8.2	8.0
SD	0.6	1.5	1.5

Manipulation Check

We deemed that a manipulation check was necessary to confirm that the two modeling techniques used were in fact distinct from each other. That is, that the self-modeling video presented near perfect performances, whereas, the self-observation video included error performances. To confirm this, two raters, who were blind to the participants' experimental groups, viewed 50% of the self-modeling and self-observation videos. For each video they indicated whether they thought it was a self-observation video or a self-modeling video. The findings showed that for 96% of the videos the raters correctly identified the intervention video.

Correlation Analysis

The correlation coefficients are displayed in Table 5. To reiterate, the experimental groups were accorded a numerical value according to their hypothesized effectiveness (control group = 0, self-observation = 1, and self-modeling = 2). This was entered into a correlation matrix along with the other measures. From Table 5, it is apparent that the interventions were correlated with swimming performance, self-satisfaction, motivation, and self-efficacy. A strong relationship between the interventions and the dependent measures was present. The results also indicated that self-efficacy beliefs, intrinsic motivation, and self-satisfaction were predictive of superior swimming performance due to their strong positive correlations. Finally, all the self-regulatory processes showed strong relationships with one another, with the exception of self-efficacy and motivation, as they were not significantly correlated.

Table 5

Correlations between the Independent and the Dependent Variable

Variable	1	2	3	4
1. Intervention	-			
2. Swimming Performance	.571**	-		
3. Self-Satisfaction	.604**	.498**	-	
4. Motivation	.703**	.562**	.443**	-
5. Self-Efficacy	.413*	.605**	.637**	.253

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

Discussion

The main purpose of this study was to investigate the impact of two self-as-model interventions, namely self-modeling and self-observation, on children's self-regulation of learning and swimming performance. Previously, two hypotheses had been presented. First, we hypothesized that the children in the self-modeling group would demonstrate superior swimming performance and encourage self-regulatory processes to a greater extent than the self-observation and the control groups. This finding was supported as the results of the retention phase showed that the self-modeling group demonstrated superior swimming performance, greater self-satisfaction, higher self-efficacy beliefs, and was more intrinsically motivated as compared to both the self-observation and the control group. It is important to note that the findings mentioned here were obtained from the results of the retention phase of the experiment. The acquisition phase findings showed the same trends as the retention phase; however, the significant differences only became clear in the retention phase. This is significant as Schmidt and Bjork (1992) argued that the level of retention displayed reflects the amount of learning that occurred.

Second, we proposed that the self-observation group would promote greater self-regulation of learning and swimming performance as compared to the control group. Our results, however, did not support this suggestion. No significant differences between the self-observation group and the control group in terms of swimming performance, self-satisfaction, self-efficacy beliefs, or intrinsic motivation were found. The fact that the self-observation group did not seem to benefit from the intervention was a surprising finding. These results were surprising because previous research by Kitsantas, Zimmerman and Cleary's (2000) identified that a coping model (i.e., a model that was learning) was unmistakably more effective than the control group at improving dart skill performance and the self-regulatory mechanisms of self-efficacy, self-reactions and intrinsic interest.

There are some differences between the current study and Kitsantas et al.'s (2000) study that potentially resulted in the equivocal findings between our self-observation and control groups. One such difference was that during the testing session in Kitsantas et al.'s study when the participants viewed the coping model video, they identified the model's mistakes. Furthermore, the researcher confirmed the mistakes that the participants identified as being right or wrong. This enabled the participants to gain the coping model's performance feedback, which Adams (1986) identified as being an essential component of viewing a model that was learning. This is important because it allows learner's to be involved in other cognitive activities associated with learning. In the current study we did not provide any feedback to the participants in the self-observation group while they viewed themselves perform with errors. The addition of this aspect should be considered in future self-observation research.

The major difference between our study and Kitanstas et al.'s (2000) study was that we used the self-as-as-model instead of having the participant's view someone else improving, as occurred with the coping model in the Kitsantas et al.'s study. The information obtained from the experience of viewing someone else appears to be different from viewing oneself perform. Comparing the influence of other modeling and the self-as-a-model on the self-regulation of learning would be another fruitful area for future research.

The results from the present study support the findings from previous research on self-modeling in that the self-modeling intervention had a positive impact on self-efficacy beliefs. Moreover, our results extend previous research findings as we also introduced measures of intrinsic motivation, self-satisfaction, and physical performance, all of which showed positive influences. It was evident that the self-modeling group surpassed both the self-observation and the control groups in their ability to self-regulate their learning process.

Revisiting Zimmerman's (1989, 2000) triadic framework of self-regulatory functioning, viewing oneself perform to the best of one's ability before each swimming session likely modifies one's self-motivational beliefs, such as self-efficacy and intrinsic motivation, which are two self-regulatory processes involved in the forethought phase. Self-modeling also appears to increase one's self-satisfaction regarding one's performance, which is a component of the self-reflection phase. Considering the cyclical nature of Zimmerman's theory, this high degree of self-satisfaction exhibited by the self-modeling group most certainly had an impact on the forethought phase prior to subsequent performance attempts. Moreover, although not tested, it is possible that the processes in the forethought phase influenced the processes involved in performance control, which in turn affected the children's self-satisfaction. Together this entire process of the self-regulation in learning resulted in the children's swimming performances.

The cyclical nature of Zimmerman's (1989, 2000) theory of self-regulated learning is further supported by the findings from the correlation analyses. In fact, the correlation results showed many strong positive relationships between the dependent variables. There did not exist, however, a correlation between self-efficacy and motivation. This is surprising considering that previous research (Kitsantas, Zimmerman, & Cleary, 2000; Zimmerman & Kitsantas, 1997) found a strong correlation between self-efficacy and intrinsic interest. A closer look at their intrinsic interest measure and our motivation measure, however, show differences in what was being measured. For example, the intrinsic interest measure compared their preference for the skill they were learning as compared to other physical activities, whereas our motivation measure was specifically focused on the children's motivation to learn challenging skills. This difference may contribute to the dissimilar findings. Additionally, the correlation analyses showed that self-efficacy, motivation, and self-satisfaction were strong predictors of physical performance. Unfortunately, due to our small sample size we were unable to determine the extent to which each of the self-regulatory mechanisms contributes to predicting physical performance outcomes, as regression analyses could not be computed. Research with larger sample sizes that could allow for such analyses is recommended.

To date not all self-modeling studies have shown the same types of benefits on self-regulatory mechanisms and physical performance as in the current study (e.g., Starek & McCullagh, 1999; Winfrey & Weeks, 1993). Perhaps, this is due to such factors as the longer intervention period, the practice schedule, or even the motor skill chosen. For example, other research has used shorter interventions with a distributed practice schedule (Starek & McCullagh, 1999). As well, swimming skills seem to benefit from self-modeling (Dowrick & Dove, 1980), but other motor skills have not shown benefits (Winfrey & Weeks, 1993).

It is interesting to note that, while the performance data clearly demonstrated that the self-modeling group's swimming performance was superior to both the self-observation and control groups, that there were no differences between the groups on the recognition test. This is an interesting finding because it was expected that the recognition test scores would follow a similar pattern to the physical performance scores. This is significant because it appears that, although the children in the self-modeling group were superior at performing the swimming skill, their ability to recognize correct and error performances was the same as the self-observation and control groups. In addition, the children's ability to distinguish between adequate and error performances was not exceptionally high, suggesting that for some reason the self-as-a-model interventions did not have the anticipated positive impact on children's error detection and correction mechanisms (Bandura, 1977; 1986; 1997). Future research would want to discern if this is in fact the case or if other variables influenced this finding. Furthermore, the children's ability to identify all four errors in the error recognition clip was the same among the groups and on average the children only identified one and a half errors out of a possible four. Perhaps this occurred because we did not inform the children that they should look for four errors, the researcher simply informed them to identify all of the errors that they noticed. As a result, this task may not have been as clear as required for young children.

In summary, the present research supported that a self-modeling intervention is a valuable technique for promoting the self-regulation of learning and improving swimming performance with young children. These findings have implications for physical educators and coaches involved with teaching children novel motor skills. For instance, coaches and instructors who are considering the implementation of self-as-a-model video feedback techniques may wish to consider our findings, as this technique appears to be most valuable when learner's view themselves perform to the best of their ability. Therefore, the time and effort involved in constructing and implementing a self-modeling intervention was deemed as worthwhile, as it is a powerful teaching technique.

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CHAPTER 3 - Article 2

The cognitive processes underlying self-modeling and self-observation:
What are children thinking about?

Abstract

The current study examined two types of video feedback, self-observation and self-modeling, with the goal of understanding the thought processes that unfolded when children viewed feedback in this form. The current study employed a think-aloud protocol (Ericsson & Simon, 1996) with young children ($n = 22$) who were learning how to swim. The children (mean age = 8.3 years) were randomly assigned to either a self-modeling group or a self-observation group. They participated in an eight-day intervention program during which time the children were instructed to verbalize all of their thoughts while watching their respective self-modeling or self-observation videos. The analysis of the verbal protocols consisted of two distinct phases. The first phase used an exploratory approach to discover the emerging themes that arose from the verbal protocol. The second phase, the comparison phase, compared the thought processes involved in self-modeling and self-observation. The results from the exploratory phase of the study clearly showed that the majority of the children's verbalizations were self-evaluative in both a positive (Descriptive Positive), and negative (Descriptive Negative) direction, as well as being related to future skill improvement (Prescriptive). These finding are discussed in terms of how they relate to Bandura's social cognitive theory of modeling (1977, 1986, 1997). The comparison phase revealed very few differences between the self-modeling and the self-observation interventions, suggesting that children appear to be gaining information about their skill performance and what to do to improve their next performance attempts regardless of the type of intervention.

Learning to perform and perfect motor skills arises from a complex interplay of internal and external influences. One of the most commonly used and widely researched techniques for motor skill acquisition is augmented feedback (herein referred to as feedback; see Schmidt & Lee, 1999 for a review). The type of feedback that was of concern for the current research can be received by viewing oneself performing a skill on video, often referred to as video replay or video feedback. Specifically, two types of video feedback, self-observation and self-modeling, were administered with the goal of understanding the thought processes that unfolded when children viewed feedback in this form.

It is important to distinguish between self-modeling and self-observation because the two terms are often used interchangeably, despite the fact that they are distinct interventions that may function differently (Dowrick, 1999). Self-observation is the process of viewing oneself on video performing a skill at one's current skill level. Alternatively, a self-modeling intervention consists of an edited video of the learner demonstrating only his/her best performance of the skill. Thus, unlike self-observation, the self-modeling video would not contain obvious errors in performance (Dowrick, 1999).

This form of video feedback falls under the broad research category of modeling, also referred to as observational learning. Much research has been conducted on the impact of other models (i.e., not the self-as-a-model) on skill acquisition, with the focus of determining the best type of model to observe. Low status models versus high status models (e.g., McCullagh, 1986), learning versus correct models (e.g., Hebert & Landin, 1994) and peer mastery versus peer coping models (Clark & Ste-Marie, 2002; Weiss, McCullagh, Smith & Berlant, 1998) are just some of the types of models that have been investigated. Generally, the results from these past studies show that that the more similar the model is to the observer, the more effective that model will be. Given such findings, it is reasonable to assume that the self as a model would be an effective form of video feedback for motor skill acquisition.

Surprisingly, however, only limited research has been conducted on self-modeling and self-observation in the motor learning literature. Despite the rather abundant status of research on such interventions for cognitive and behavioral skills (see Dowrick, 1999 for a review). Even though the self-modeling research with motor skills is limited, the use of this intervention with both disabled children (e.g., Dowrick & Dove, 1980; Dowrick & Raeburn, 1995) and able-bodied adults (e.g., Drazin, 1985; Melody, 1990) have been investigated. More specifically, Dowrick and Dove examined the impact of using a self-model to improve the water skills of children with spina bifida. This study found that the participants' water skills that received a self-modeling intervention improved to a greater extent than the water skills that did not receive the self-modeling intervention. Dowrick and Raeburn conducted a similar study with physically disabled children who had difficulty performing every day activities such as walking unaided, tying shoelaces, etcetera. As with the Dowrick and Dove experiment, Dowrick and Raeburn also discovered that the children performed the self-modeling skill with the greatest proficiency. Furthermore, self-modeling studies have also been conducted with able-bodied participants attempting to learn motor skills. Studies by Drazin (1985) with golfers and Melody (1990) with basketball players found that a self-modeling intervention was helpful in increasing golfers' abilities to successfully make putts and self-modeling dramatically improved the players' free throw percentages.

Similar to the research examining self-modeling and motor skill performance, there are a limited number of studies that have examined self-observation with motor skills (e.g., Laguna, 1996; Zetou, Fragouli & Tzetzis, 1999). For instance, Zetou, et al. conducted a study with children learning two volleyball skills. The children either viewed an expert model or themselves performing at their current skill level (self-observation). The results supported the use of a self-observation intervention for improving children's volleyball skill performance.

Although self-modeling and self-observation appear to be two effective video feedback techniques, little is known about what contributes to their effectiveness. In recent years, however, some researchers have attempted to assess not only the impact of a self-modeling intervention on physical performance, but also to delineate the psychological mechanisms involved in the self-modeling process (e.g., Bradley, 1993; DeGhetaldi, 1999; Starek & McCullagh, 1999; Winfrey & Weeks, 1993). The mechanisms that have been of most interest to researchers in recent years are self-efficacy and anxiety. For instance, Starek and McCullagh (1999) compared the impact of a peer model versus a self-model on swimming performance, self-efficacy beliefs, and anxiety levels with beginner swimmers. The results showed moderate support for the use of a self-model when compared to a peer-model, as there were performance differences between the two groups. In terms of self-efficacy and anxiety, however, the two groups performed similarly.

While some researchers have begun to study the psychological mechanisms involved in self-modeling, our particular interest for the current study was to learn more about what children are thinking about/attending to while watching video feedback. We proposed that a qualitative assessment of self-modeling and self-observation was warranted in order to gain a broader understanding of these two techniques. To date, only one study by Ram and McCullagh (2003) has attempted to qualitatively investigate the use of a self-model. Using a think-aloud protocol (Ericsson & Simon, 1996), Ram and McCullagh tapped into what intermediate, college-aged, volleyball players were thinking about while watching themselves on videotape. Unfortunately, the information obtained was not especially rich in terms of the verbalizations reported by the participants. Ram and McCullagh did conclude, however, that viewing the self as a model does command the attention of the observer. Thus, providing support for further investigations into the cognitive processes that may underlie the self-modeling process.

The current study also employed a think-aloud protocol, however, our population was young children and the motor task was swimming. We anticipated that a think-aloud protocol would provide us with a greater comprehension of the thought processes engaged in during video feedback. Such an understanding will provide us with increased insight into what children are paying attention to while they view themselves performing swimming skills. Moreover, this information will further our understanding with regards to the types of cognitive processing that occurs while children view themselves on video.

Not only did we anticipate that a think-aloud protocol would supply us with information about what children are thinking about while watching themselves on video, but this experimental design would also enable us to determine if their thoughts remained the same regardless of whether or not they are engaged in self-modeling or self-observation. Consequently, the two main purposes of the current study were investigated through a two-stage analytic design. More specifically, at the first level of analysis, we qualitatively analyzed what the children were thinking about while watching a self-observation or self-modeling videotape. An exploratory approach discovered the emerging themes that arose from the verbal protocol. This analysis addressed our first purpose of exploring the thought processes engaged in by young children while watching the self as a model. Due to the lack of research using think-aloud protocol in this context, no specific hypotheses were generated for this exploratory phase. The second stage, the comparison stage, involved quantitative analyses of the verbalizations and subsequent themes obtained from the children who viewed the self-observation video with those that viewed the self-modeling video. This analytic stage addressed our second purpose of better defining the thought processes associated with different interventions that can be used with the self as a model (i.e., self-modeling versus self-observation).

Method

Participants

Twenty-two children (14 female and 8 male) between the ages of 6 and 10 years old ($M = 8.3$, $SD = 1.4$) were recruited to participate in this study[7]. We recruited these children through a local summer camp swimming program, or through word of mouth. Before participation we obtained both the children's and the parent's consent.

[7]The results presented are part of a larger study in which 33 children participated; however, the focus of this paper is on the think-aloud protocol for which 22 children were involved.

Materials

A JVC digital video camera (GR-D200U) was used to videotape each child. Depending on the participant's experimental group assignment, either a self-modeling video or a self-observation video was created using Microsoft Movie Maker software program (2004). The self-modeling video was edited so that it only showed clips of each participant's correct performance attempts of the skill. The self-observation video was not edited and the performance attempts that contained errors remained on the video, therefore, the participants viewed themselves performing the skill at their current skill level, with errors. Each clip was approximately 15 seconds in length, which was roughly the duration it took the participants to complete a 10 m swim. This same clip was then repeated four times to create a vignette that was approximately 60 seconds in length.

During the course of the experiment, as the participants' performances of the skills shown on the self-modeling and self-observation videotapes improved, new videos were constructed. This enabled the participants in the self-modeling group to view an edited video displaying only their most adaptive behaviors and allowed the self-observation group to view their most recent performances. This technique was deemed important by Dowrick (1999) and Winfrey and Weeks (1993), as participants have been negatively influenced when they were unable to view themselves improving. The 15-inch screen of a Dell Inspiron 2600 lap top computer displayed the video feedback footage and a Sony cassette recorder (TCM-200DV) audio taped the children's verbalizations.

We developed a motivation to swim scale to ensure that the participants were motivated to learn the chosen swimming skill. To this end, the participants were posed the following question, "how important is it that you learn how to do the swimming skill perfectly?" They were asked to respond on a 10-point Likert scale, where one was not important at all and 10 was very important.

Procedures

The research described here was part of a larger study on the modeling techniques of self-modeling and self-observation. For the purposes of this current paper, the aspects related to the think aloud components will be emphasized, but other details will also be provided to give an in-depth picture of the experimental design. The think-aloud data was collected during the pre-test phase and intervention phases of the experiment. A retention phase was also conducted, but was not part of the think-aloud protocol and, thus, will not be discussed herein.

Prior to the first session of the study we randomly assigned the children to an experimental group and measures were taken to ensure that the ages and gender of the children were distributed evenly across the three experimental groups (see Table 6).

Table 6

Participant Distribution among the Three Experimental Groups for Age and Gender

	Experimental Group	
	Self-Modeling N = 11	Self-Observation N = 11
Age		
6	1	1
7	2	3
8	3	2
9	2	2
10	3	3
Gender		
Male	4	4
Female	7	7

Pre-test Phase. For the first phase of the experimental protocol, the swimming instructor asked the children to attempt to perform a series of swimming skills that were selected from the Aquaquest Canadian Red Cross Water Safety Program (1996) guidelines. In order to determine the swimming skills that each child would perform, they were asked to first inform the swimming instructor of the Aquaquest level that they had most recently completed. This was done to ensure that the skill selected was from a level higher than the one they had completed. From the children's performance of these skills, one skill was chosen by the instructor based on the following two criteria: (1) they could occasionally perform the skill correctly, but with little consistency. Specifically, the participants had to demonstrate the stroke being performed correctly at least once over a 10m swim, this was evaluated by a certified swimming instructor, and (2) they indicated they were motivated to learn the swimming skill chosen, as determined by the motivation to swim scale (scores greater than 6 on a 10 point Likert scale were used as the indicator of this). While the children performed the chosen skill, the researcher filmed from the side angle, while standing on the pool deck, no more than 5 m away from the participant. Furthermore, the zoom function on the camera was used to ensure that the video contained only the participant and no other environmental details, in order to minimize distractions.

After this session, the chosen swimming skill was transferred to video computer discs (CD's), in order to construct the self-modeling and self-observation footage. It is important to note that the swimming skills chosen differed among the children, but we believed this to be worthwhile in order to ensure that the two aforementioned criteria were fulfilled. As a result, the following five swimming skills were used in the present study; front crawl, back crawl, breaststroke, elementary backstroke, and butterfly (see Table 7).

Table 7

Breakdown of Swimming Strokes by Group

	Experimental Group	
	Self-Modeling N = 11	Self-Observation N = 11
Stroke (skill level)		
Front Crawl	5	5
Back Crawl	1	1
Breaststroke	4	4
Elementary Backstroke	1	0
Butterfly	1	1

Intervention Phase. Across six consecutive days, following the pre-test phase, each child participated in six swimming lessons, each lasting approximately 30-minutes (the duration of a regular Red Cross swimming lesson). Children participated in these lessons in groups of two or three[8], however, the instruction was always one-on-one as the children would complete a swimming trial and receive feedback before the next child completed a trial. During these swimming lessons, the swimming instructor first showed the children their self-modeling or self-observation video. While viewing their video, the children were seated directly in front of the computer screen, approximately 40 cm away from the screen. These videos consisted of four-15 second clips of the swimming stroke chosen for the experiment.

Following this, the children engaged in a swimming lesson with a swimming instructor that was specific to the experimental swimming stroke identified. The swimming instructor provided verbal feedback to each participant on skill execution and followed a feedback schedule where the participants were given one positive feedback and one corrective feedback comment after each 10m swim. This ensured that similar feedback was provided to all participants. In addition, the instructor was also responsible for ensuring that the same amount of practice time was allotted for each child. At the end of each swim lesson, the child was asked to perform the swimming stroke to the best of his/her ability for a 10m distance. This performance was used to update the self-modeling and self-observation videos throughout the experiment.

Think-Aloud Verbalizations. Concurrent reporting was used to record the children's verbalizations (Ericsson & Simon, 1996). This type of think-aloud protocol requires participants to think aloud as they are performing a task. In this case, the task was watching the self-modeling or self-observation video. Note that they were not verbalizing what they were thinking of at the time of doing the swimming skill, rather, the participants were talking out loud about what they were thinking about while they were watching themselves on the computer screen. To do this, the participants were shown, dependent on their group assignment, their self-modeling or self-observation video four consecutive times each during every intervention session. During the odd numbered intervention sessions (1, 3,5), the swimming instructor asked the participants to verbalize all the thoughts that went through their head while viewing the video for the first and third video clips in each session, whereas, for the second and fourth observations, they were instructed to simply attend to the video. For the even numbered intervention sessions (2, 4, 6), the swimming instructor asked the participants to verbalize

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[8]When the participants were in groups of two or three it was ensured that they did not watch the other children swim or hear the feedback given to the other participants by the instructor.

during the second and fourth video clip observations, with the first and third observations done under full attention to the video. This alternation was undertaken to ensure that the participants had the chance to fully attend to the information provided on the computer screen for at least two of the four viewings (see Ste-Marie, Clark, & Latimer 2002 for the importance of this), as well as to eliminate potential confounds as to when the verbalizations were made.

To persuade the participants to verbalize their thoughts while viewing their self-modeling or self-observation video, the swimming instructor encouraged the children to watch themselves carefully and say out loud anything that they were thinking about that had to do with their swimming. If the children were quiet, then the swimming instructor would prompt the children to continue talking by saying, "remember to say out loud what you are thinking about". If the participant's verbalizations were off topic the instructor would prompt them by saying, "remember to talk about your swimming".

Data Analysis: Exploratory Stage

The first phase of the data analysis involved transcribing verbatim the children's think-aloud verbalizations. These transcribed verbalizations were organized separately for each of the six experimental sessions in which the participant's were instructed to think-aloud. Following this, a group of researchers read the verbalizations and discussed possible categorical themes for the verbalizations. The principal investigator (PI) used this discussion to independently create the labels for each of the themes. The transcriptions and themes created by the PI were returned to the original group of researchers who were then divided into two groups. Independently, in each group, the researchers coded a portion of the transcriptions according to the guidelines the PI had provided and subsequently entered into discussion about their coding outcomes. The two groups reassembled and discussed the difficulties and uncertainties encountered. The PI used this information to refine the coding themes, with 11 themes emerging.

Using a qualitative data analysis software program (Atlasti 4.1 for Window 95), the transcribed verbalizations were organized according to the themes. An acceptable level of inter-rater reliability was obtained by first having two individuals discuss the various codes and then code the transcripts individually. The second step involved comparing the results for any major discrepancies between the two raters using a Pearson's correlation. No large discrepancies were evident as a Pearson's *r* of 0.9 was obtained, an acceptable level for inter-rater reliability (George & Mallery, 2003).

Results and Discussion: Exploratory Stage

The exploratory phase of this study revealed some interesting results regarding what children think about when observing video feedback through self-modeling and self-observation videos. Table 8 provides a list of the 11 themes that emerged, along with a description of their meanings, and an example verbalization for each. As a result of the strong similarities between the themes and the augmented feedback literature, some of the terminology for the themes rely on that previously used in classifications of augmented verbal feedback (see Magill, 2001). In reviewing the themes that emerged, it was apparent that the participants were in fact using the videos of themselves as a form of feedback.

Table 8

Emergent Themes from the Think-Aloud Verbalizations

Theme	Description	Example
Descriptive Positive	A positive self-evaluation of swimming performance focused on the execution of specific components of the stroke during skill performance	"It looks like I am keeping my arms straight"
Descriptive Negative	A negative self-evaluation of swimming performance focused on the execution of specific components of the stroke during skill performance	"My arms are coming too far apart"
Prescriptive	A comment pointing out what they need to do to improve their swimming performance in future attempts, focused specifically on the execution of specific components of the stroke during skill performance	"I need to move my arms higher next time"
Descriptive General Positive	Positive general statements about their swimming ability. General because they provide no explanations	"I think that I am really good at swimming"
Descriptive General Negative	Negative general statements about their swimming ability. General because they provide no explanations	"I don't think I am very good at front crawl"
Affect-Past	Statements indicating how they feel about swimming retrospectively	"It is uncomfortable kicking like that"
Affect-Present	Statements indicating how they feel about swimming presently	"I really love swimming"
Improvement Statements	General verbalization indicating a noticed positive change in swimming ability	"I am definitely better at front crawl"
Observation Statements	Descriptions of what they see themselves doing, does not include and evaluation component	"I am closing my eyes when I am swimming"
Demonstrations	When, while watching their video clip, the children physically show what they are doing	"When my arms come up they are like this"
Miscellaneous	Unrelated statements, usually focused on appearance, questions about swimming ability, or unrelated information or questions	"My bathing suit looks like a different color."

Subsequent to the coding of the data, frequency data were obtained. First, the overall number of verbalizations was identified. In this case, a verbalization consisted of any statement that the participant made that referred to a single idea. An example of one verbalization is, "I need to bring my arms out of the water higher". The number of verbalizations across the six sessions varied greatly among participants, with a range of 17 to 80 ($M = 27.5$, $SD = 13.9$) verbalizations. This variation was likely due to individual differences as some children are quiet and others are "talkers". The variation observed in the number of verbalization, however, did not vary among experimental group or gender (see Table 9).

Table 9

Mean Frequency and Standard Deviations of Verbalizations across Experimental Groups and Gender

	Frequency	SD
Group		
Self-Modeling	28.6	8.0
Self-Observation	26.4	8.9
Gender		
Male	25.9	8.0
Female	30.3	11.2

Due to the difficulty associated with interpreting the absolute number of verbalizations, these numbers were converted into percentages to enable accurate comparisons of the themes. This method of using percentages has been shown to be effective in other think-aloud studies with motor skills (e.g., Martini, Wall & Shore, 2004). In Table 10 we report the mean percentages of verbalizations for each session by each theme that emerged (calculated by dividing the number of verbalizations for each category by the total number of verbalizations during that session). These percentages provide an overview of the participants' thought processes across the sessions. From

Table 10, it was apparent that the greatest percentage of the children's verbalizations fell into the Descriptive Positive (15.5%), Descriptive Negative (11.5%) and Prescriptive (37.2) themes over the six sessions. Indeed, these percentages totaled to 64.2%, with only 35.8% of the verbalizations in the remaining eight themes.

Table 10

The Mean Percentages of Verbalizations for Each Session by Theme (N = 22)

Theme	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
Descriptive Positive	5.8	20.0	7.1	19.3	22.5	12.6
Descriptive Negative	26.6	13.0	9.6	11.4	6.2	3.5
Prescriptive	36.5	33.5	50.2	43.9	37.8	32.6
Descriptive General Positive	10.2	8.1	12.4	12.1	12.4	17.2
Descriptive General Negative	6.0	3.0	1.5	0	1.1	3.0
Affect-Past	0.9	0.6	0	2.7	0	1.8
Affect-Present	0.9	2.2	3.4	1.5	3.2	3.0
Improvement Statements	1.1	9.0	5.2	3.6	0.5	16.2
Observation Statements	3.1	3.3	2.1	3.1	2.5	2.3
Demonstrations	0.3	1.8	1.5	0	1.0	4.3
Miscellaneous	7.9	6.2	6.9	2.5	6.6	3.5

Furthermore, Table 10 also allows an examination of the trend in the verbalizations across the six sessions. The percentage of Descriptive Negative verbalizations decreased fairly consistently throughout the six sessions, indicating that viewing one's swimming skills on video yields a decrease in one's negative thoughts and perceptions of one's skill performance. The findings for the Descriptive Positive comments, though, follow a pattern that was difficult to interpret. The learners started out with a very low number of positive comments and showed a dramatic increase in session 2. This category's percentage fell quite low again in session 3 and then showed a steady increase in sessions 4 and 5, only to return to a lower percentage in session 6. Perhaps an expected pattern would have been a steady increase across the session, assuming a parallel with an improvement in swimming performance, but the "ups and downs" seen make it difficult to make an association. Future research should determine if this pattern is repeatable and probe into the more volatile nature of positive evaluative thought processes.

Finally, we would also like to draw attention to the percentage of Prescriptive verbalizations, which remained quite similar across the six sessions (with a slight increase in session 3). Of interest is that this Prescriptive category was the most common type of verbalization, thus providing support for the use of modeling as an error detection and correction mechanism. Specifically, it confirms Bandura's (1977, 1986, 1997) notion that as learners view themselves perform they are capable of determining their errors and use this information to make plans about how to correct these errors in future performance attempts. The fact that these young learners intuitively concentrated on prescriptive comments is also exciting considering that motor learning literature prescribes to the idea that prescriptive knowledge of performance comments are more helpful for beginning learners than descriptive comments (Magill, 2001).

Data Analysis: Comparison Stage

The main interest of the exploratory investigation was to determine what children verbalize while watching video feedback, however, since our experimental design consisted of both a self-modeling intervention and self-observation intervention group, our design begs the question; do these different interventions result in different patterns of verbalizations? As stated earlier, no studies to date have compared these two types of interventions that use the self as a model, however, based on the types of information learners receive from each intervention, three predictions were put forward. The focus of this quantitative analytic component is on three of the 11 themes that emerged from the exploratory phase, specifically the Descriptive Positive, Descriptive Negative, and Prescriptive themes. These three themes were chosen because they were the commonly occurring verbalizations.

Certainly, there were key differences between the types of information provided by these two video feedback forms. To reiterate, a self-modeling intervention provided learners with a video containing only their best performance, therefore, obvious error performances were removed from the video before the learner viewed the video. In contrast, the self-observation intervention involved showing learners an un-edited video of their skill performance. Thus, the participants in this group viewed their swimming stroke that contained both correct and error performance attempts. As such, the group who saw the self-modeling video would see themselves performing better than would the self-observation group, likely leading to more positive comments than negative comments, and vice-versa for the self-observation group. This effect, however, may decrease as the children progress with the intervention. That is, as the self-observation group's swimming performance improves, the corresponding video footage also shows a stronger performance. Thus, differences in verbalizations may be apparent early in the intervention but then disappear. Based on this, our first prediction was that a two-way interaction would occur with the relative percentage of the Descriptive Positive and Descriptive Negative comments differing across the two groups early in the intervention, but not in the latter stages.

Furthermore, we predicted that the percentage of Prescriptive comments would be greater for the self-observation group as compared to the self-modeling group, but again, this difference would occur early in the intervention, and then fade. The logic here was that viewing one's errors would likely encourage statements concerning how one can improve in subsequent performance attempts. Thus, the number of prescriptive comments made by the self-observation group would show a decline across the experimental sessions because the children are viewing their performance improve. The self-modeling group, however, would show a similar number of prescriptive comments made across the sessions due to the likelihood of a similar high performance level across the viewings of the video footage.

To investigate these predictions, a 2 (Group) X 3 (Theme) X 6 (Session) analysis of variance, with repeated measures on the last two factors was conducted with the computed percentages. The alpha level was set at .5 and partial eta squared (η^2) was used to report effect sizes.

Results and Discussion: Comparison Stage

The overall mean number of verbalizations for the six sessions combined were similar for the two groups (self-modeling group = 26.4 verbalizations; self-observation group = 28.6). Apparently watching a video clip of oneself performing perfectly versus performing with error elicits the same amount of verbalizations. Before entering into the results and discussion of our specific predictions, we will report on other significant findings of the repeated measures ANOVA, which support our earlier comments in the exploratory stage. First, the analysis revealed a main effect for Category, $F\,(2,40) = 10.5$, $p = 0.001$, $\eta^2 = .4$. Post hoc testing indicated that a significantly higher percentage of Prescriptive verbalizations ($M = 39$) were made as compared to the Descriptive Negative ($M = 11.7$) and Descriptive Positive ($M = 14.6$) themes, which did not differ from each other.

The analysis also revealed a main effect for Session, $F\,(5,100) = 2.7$, $p = 0.02$, $\eta^2 = .2$. In effect, the overall percentage of the verbalizations in the three themes remained the same for the first five sessions, Tukey post hoc testing revealed that there was a significant decrease in the percentage of verbalizations occurring in the sixth session. This finding was interesting as it indicates that by the last session, the participants had less to say about what they viewed on their video. Perhaps, an intervention that was one day less in duration would be equally as effective.

In conjunction with these main effects, an interaction between Category and Session was also found, $F\,(10,200) = 2.4$, $p = 0.01$, $\eta^2 = .2$, indicating that the pattern of findings across sessions was different across the three themes. Tukey post-hoc testing revealed that in Sessions 1 and 2 a significantly greater percentage of Descriptive Negative comments than Descriptive Positive comments were verbalized. For Sessions 3 and 4 there existed no differences between the percentage of Descriptive Positive and Descriptive Negative comments. Conversely, the results show that for Sessions 5 and 6 there was a significantly higher percentage of Descriptive Positive comments as compared to the percentage of Descriptive Negative comments. Overall, this pattern of findings demonstrated a switch across sessions from a higher percentage of Descriptive Negative comments in the first two sessions to a greater percentage of Descriptive Positive comments in the last two sessions. Finally, a significantly greater percentage of Prescriptive comments were verbalized during all six sessions when compared to both the Positive Descriptive and Negative Descriptive themes.

Of more interest to us though were the findings related to the potential interactions across the themes and sessions as a function of group assignment to a self-modeling or self-observation intervention. Our predictions concerning the Descriptive comments were not supported as no significant interaction occurred between the two groups across the sessions for either the Descriptive Positive or Descriptive Negative themes. Although the pattern of results fall in line with our predictions in the early sessions, for both the descriptive positive and descriptive negative comments (see session 1 and 2 in Figure 5), these differences were not significant.

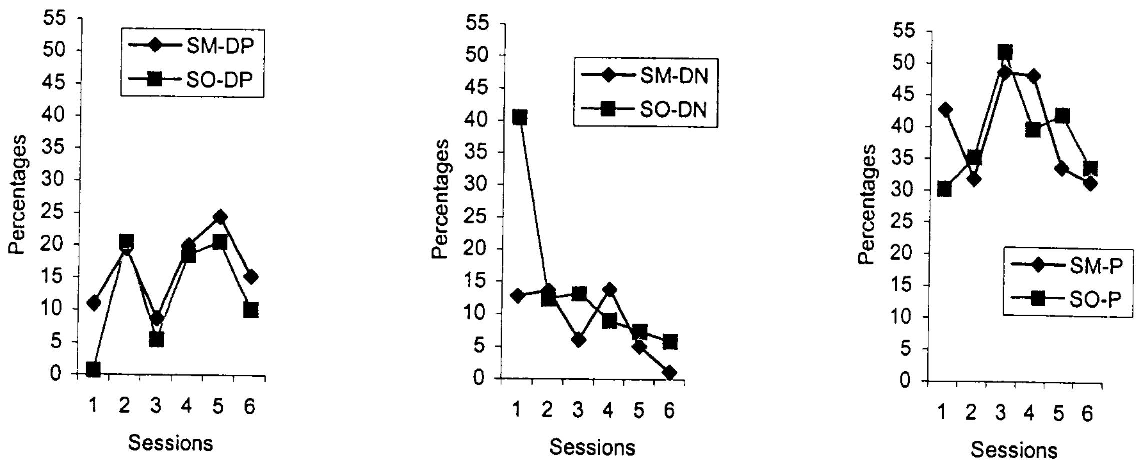

Figure 5. Percentage of verbalizations for the Descriptive Positive (DP), Descriptive Negative (DN) and Prescriptive (P) themes across six sessions for the self-modeling (SM) and self-observation (SO) groups.

The results for the Prescriptive category, also contradict our prediction that the pattern of results for the prescriptive comments would be different between the self-modeling and self-observation groups. In actual fact, the percentages of Prescriptive comments for these two groups were virtually the same (see Figure 5). While contradictory to our expectations, upon further reflection, it was plausible that even though the self-modeling group only saw themselves perform to the best of their ability, they likely knew that in reality they did not consistently execute the swimming skills at the that level. As a result, their Prescriptive verbalizations may have concentrated on making comments about how they need to always do what they were watching on video. This inconsistency with the original prediction may also have had to do with the critical nature of viewing oneself on video. For example, regardless of how well one is performing, it may always be possible to find errors that need to be improved upon in the next attempt.

General Discussion

The overall purpose of the present study was to investigate the use of a think-aloud protocol while children learning swimming skills viewed self-modeling or self-observation videos. More specifically, the first main goal was to explore what children cognitively process while watching themselves perform a swimming skill, regardless of whether or not it was a self-modeling or self-observation video. A secondary goal was to compare the verbalizations of the self-modeling group and the self-observation group to determine whether any differences existed between these two interventions in terms of what they encourage children to cognitively process.

The exploratory stage of the study clearly showed that children engage in various cognitions while watching themselves on video. The verbalizations spoken by the children were separated into 11 different themes (refer to Table 8). The exploratory analysis indicated that the type of information processed by the children varied, however, the majority of their verbalizations focused on comments about the swimming performance that they were viewing. While the percentages of Affect, Observation and Improvement statements were quite small, a large number of the comments were self-evaluative in both a positive (Descriptive Positive), and negative (Descriptive Negative) direction, as well as, being related to future skill improvement (Prescriptive). These verbalizations enabled us to gain a deeper understanding of the cognitions generated by video feedback.

These findings strongly support Bandura's (1977, 1986, 1997) social cognitive theory of modeling, given that the children in the current study appeared to use the video of themselves performing as feedback information about how to improve their swimming performance. This would suggest that the self-modeling and self-observation videos encouraged the participants to detect and suggest corrections for future performances, which is another key concept in Bandura's social cognitive theory. This suggestion, however, would have to be further justified by confirming that the children's descriptive and prescriptive verbalizations were in fact accurate. In addition, the results support other research that has found that similar models encourage learners to focus and pay attention to the demonstration. In fact, the children in the present study exhibited very little difficulty in verbalizing their thoughts, and rarely had to be reminded by the investigator to refocus or be prompted to continue verbalizing.

These results are different from those obtained by Ram and McCullagh (2003), in that their participants verbalized very little about skill performance and made more statements related to the shock and surprise of viewing themselves on videotape. Perhaps the difference in the results found in the current study lies in the fact that we examined children who were having difficulty learning a swimming skill instead of adults who were at the intermediate level for volleyball. It could be that the children had yet to develop preconceived ideas about how they thought they should look performing the swimming skills or were simply less concerned with that aspect, as compared to the adults in Ram & McCullagh's study. This may have resulted in the large number of skill performance related comments observed in the present study.

An additional interesting finding has to do with the number of prescriptive verbalizations made by the participants, as the majority of the participants' comments were included in this category. The positive impact that prescriptive statements have on learning is supported by the feedback literature. For example, Lee, Keh and Magill (1993) suggest that prescriptive feedback is more effective than descriptive, as prescriptive feedback is used to guide learners in improving skill performance, whereas, descriptive feedback is too general and does not provide learners with sufficient information that can be used to improve their next performance attempt. The children in the current study certainly verbalized more prescriptive statements than descriptive statements. This finding provides valuable support for the use of self-modeling and/or self-observation as a teaching technique because it appeared that the children used these interventions to make decisions about the actions that needed to be undertaken in order to improve their swimming performance in future attempts.

In the comparison phase of the current study, we compared the verbalizations between the self-modeling group and the self-observation group. This analysis revealed very little differences between the two interventions in terms of the themes that the children's verbalizations fit into. It seems that regardless of whether or not children view themselves perform at their current skill level with errors (self-observation) or to the best of their ability with errors edited out (self-modeling), they still appear to be gaining information about their skill performance and what to do to improve their next performance attempts.

In conclusion, the novel introduction of a think aloud protocol in this modeling study provided insight into the cognitive processes engaged in by children while viewing self-modeling and self-observation videos. Future research in this field using a think-aloud protocol is certainly warranted, as it would be fruitful to investigate the cognitive processes resulting from a comparison of self-modeling, self-observation, and other modeling interventions.

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CHAPTER 4 -Anxiety and Goal Setting

There are specific reasons for the exclusion of the goal setting and anxiety measures from the articles in the previous chapters. Due to the fact that anxiety was not originally considered in Zimmerman's (1989, 2000) theory of self-regulated learning, I decided that these findings were better discussed separately and, therefore, anxiety was not included in the articles. The goal setting measure was also not included in the articles because the manner in which the goal setting information was obtained and analyzed did not correspond with the other self-regulatory processes, and it's description resulted in a manuscript much too long in length. Consequently, I decided that the goal setting measure findings would be most comprehensible, if described separately.

Anxiety

Anxiety refers to the physical and psychological feelings associated with inaccurately assessing one's coping ability in a particular situation (Bandura, 1997). Individual's anxiety levels have been known to have a strong impact on the performance of many cognitive and behavioral tasks (Burton, 1998). For the current study I was interested in the anxiety associated with learning to perform novel motor skills. Specifically, I was concerned with the anxiety levels of young children learning various swimming strokes.

I proposed that the self-as-a-model interventions of self-modeling and self-observation would influence children's anxiety levels towards performing swimming skills. Moreover, I anticipated that these anxiety levels would then impact the processes involved in children's self-regulation of learning, which in turn would influence physical performance. Originally, I anticipated that anxiety would be an essential factor to consider because of the potential impact of this variable on learners' self-regulatory processes. Even though anxiety is not a component of Zimmerman's (1998; 2000) theory of the self-regulation of learning, it was possible that previous research had overlooked the possible mediating influence of this variable.

The rationale for including this measure stems from previous research on modeling and its impact on psychological variables. In the past, numerous experiments were conducted that examined the influence of modeling on behavior change with individuals who had extreme fears or phobias (Bandura & Adams, 1977; Bandura, Adams & Breyer, 1977; Bandura et al. 1980). Overall, modeling interventions have been effective in diminishing, or even deleting, such acute fears (see chapter 1 for greater detail). In addition to the reduction in anxiety levels, these aforementioned studies alluded to a strong relationship between anxiety and self-efficacy beliefs. Specifically, that higher self-efficacy beliefs led to decreased anxiety levels (Bandura & Adams, 1977; Bandura, Adams & Breyer, 1977; Bandura et al. 1980).

More recently, the influence of different modeling interventions on learners' anxiety levels towards learning swimming skills was investigated. Starek & McCullagh (1999) are the only researchers to date to compare the influences of self-modeling, peer modeling or practice alone on the anxiety levels of individuals learning motor skills. The results, however, did not show any effects on anxiety as a function of the modeling interventions. The authors attributed this to limitations in the study's design, namely the small number of participants. Further they recommended continued use of this measure in future research. As such, we included an anxiety measure in the current project.

As an overview, I proposed that anxiety would be an influencing variable in the triadic theory of self-regulatory functioning (Zimmerman, 1989, 2000). Revisiting Zimmerman's theory, I hypothesized that the self-as-a-model interventions would have a mediating or influencing effect on the anxiety levels of the participants and that these anxiety levels would then impact learners' self-regulatory processes, which would in turn influence physical performance outcomes. This hypothesis stemmed from the idea that the sport of swimming occurs in the water; a context that can evoke a certain level of anxiety in learners, as the water is a different environment than most sports. By implementing self-as-a-model interventions, I proposed that the participants' anxiety levels towards performing the swimming skills would decrease because the video served to reassure them that they could perform the swimming skill without being hurt or in danger. I argued that these decreased anxiety levels would be an influencing factor at improving the children's physical performance because, instead of focusing on their fear, the children would be able to place increased attention on mastering the swimming skill.

Moreover, I hypothesized that a self-modeling intervention would decrease anxiety levels to a greater extent than the self-observation intervention. The self-modeling intervention was anticipated to provide the greatest anxiety reducing benefits due to the fact that the children not only viewed themselves performing, but also observed themselves performing to their best of their ability. Observing such competent behavior would be more effective at reducing or even eliminating any anxiety related to fear of not being able to perform the skill properly. Thus, viewing themselves perform their most adaptive behaviors would decrease anxiety, resulting in an increase in the children's self-efficacy beliefs. Further, I hypothesized that the self-observation group would demonstrate greater decreased anxiety levels as compared to the control group. While I did not anticipate that this would be as effective as a self-modeling intervention, self-observation was still considered to be more effective than practice alone at reducing anxiety levels in the participants because they do get to see themselves perform at their current skill level. It is possible that by viewing themselves perform at their current skill level the participants would experience less anxiety towards skill performance as they have proof that they can perform the swimming skill without causing personal harm. Even though the participants in the self-observation group did not view their most adaptive behaviors, as with the self-modeling intervention, self-efficacy was anticipated to come into play with self-observation group because they saw themselves improving across the sessions, which should decrease their level of anxiety and increase their self-efficacy beliefs.

Procedures

The participants' anxiety levels were measured during the pre-test phase, on two occasions during the intervention sessions (mid-session 1 and mid-session 2) and during the retention test. One-half of the participants were randomly assigned to completing the questionnaire during the second and fourth intervention sessions, while the remaining participants completed the questionnaire during the third and fifth intervention sessions. As with the other self-regulatory mechanisms from Chapter two, the participants completed the anxiety measure subsequent to viewing the video for their experimental group.

Measure

The measure used to evaluate anxiety levels was The State-Trait Anxiety Inventory for Children (STAI-C, Spielberger, Edwards, Montuori, & Lushene, 1973). The STAI-C is a 20-item scale that asks participants to rate how they feel at a given moment. For example, one item posed the question: "at this very moment I feel, very calm, calm, not calm." The responses were scored on a three-point Likert scale where one corresponded to not anxious at all and three was very anxious. Therefore, the maximum score that could have been attained was 60 and the minimum score attainable was 20.

The STAI-C was chosen because, unlike most anxiety scales, it is not interested in anxiety levels during competitive situations; rather it focuses on anxiety related to the specific skills. Most anxiety scales are used with athletes in the competition setting as anxiety levels are well documented as an influencing factor in competitive sport performance (Burton, 1998). However, researchers acknowledge that high levels of anxiety are not just present in competitive situations, but can be at hand in non-competitive situations as well (Spielberger et al., 1973).

Results

Surprisingly, the hypotheses were not supported. In fact, the results from a 3 (Group) X 3 (Session – baseline, mid-session 1 and mid-session 2) analysis of variance (ANOVA) with repeated measures on the last factor did not indicate any differences among the groups in terms of the participants' anxiety levels (F (2,30) = .3, p = .77, η^2 = .02). Similarly, the one-way ANOVA for the retention anxiety scores did not show any differences between the experimental groups, F (2,30) = 1.4, p = .25, η^2 = .09 (refer to Table 11 for the means and standard deviations).

Table 11

Means and Standard Deviations for the Anxiety Measure

	Self-Modeling *n*=11	Self-Observation *n*=11	Control *n*=11
Baseline			
M	29.9	30.6	32.8
SD	5.9	3.3	4.5
Mid-Session 1			
M	30.2	29.7	30.1
SD	5.3	3.8	4.1
Mid-Session 2			
M	29.1	28.4	29.1
SD	5.9	4.9	2.9
Retention			
M	27	28.7	30.3
SD	5.8	3.8	3.6

Discussion

A key factor that can be considered to explain this finding relates to a potential floor effect that occurred with the anxiety data. That is, a look at the means from the baseline session in Table 11 shows that the children were not anxious towards the swimming skills from the outset. For example, the scores indicate that, for most items on the anxiety questionnaire, the participants responded with the option representing the least amount of anxiety. This initial lack of anxiety obviously eliminated the possible influence that the interventions might have had on the learners' anxiety levels.

Considering the sample in the current study, it does seem sensible that the children would not be overly anxious towards learning the specific swimming skills taught in the current study. This is because all of the swimmers had previous experience swimming. Thus, the initial fear often associated with first time water entry was not present as they were already aware of the nature of the swimming skills and had tried them before in their previous swimming lessons. Furthermore, the swimming skills posed little threat of bodily injury as they were not diving or jumping into the water, rather they were performing swimming strokes. Finally, when they were expected to perform the swimming skills there was always a swimming instructor very close by, which would provide them with a sense of security. Overall, it seems that the swimming skill would have to pose a greater risk in order to be able to examine the influence of anxiety levels on the self-regulation of learning.

The children's lack of anxiety was further supported by researcher observations during the study; as I was the researcher and swimming instructor who was involved with all of the children in this research. Simply by observation it was quite apparent that none of the children were overly anxious when it came to performing the swimming skills. I made a conscious effort to be aware of the participants' verbalizations regarding their feelings towards performing the swimming stroke chosen and noted that the participants gave no verbal indications that they were exceedingly anxious towards performing the swimming skills. Moreover, as a function of my years of experience as a swimming instructor, I paid close attention to the children's non-verbal communications, such as their level of comfort in the water. Again, there were no such instances that suggested high anxiety levels on the part of the participants.

These results coincide with a previous study by Weiss, McCullagh, Smith & Berlant (1998). Weiss et al. investigated the influence of two modeling interventions, peer and coping models, on children's fear of swimming. In their study, the modeling interventions did not appear to influence the participants' levels of fear either. Although, Weiss et al.'s study examined fear, the measure was similar to the anxiety measure used in this study. The results from the current study along with the findings from Weiss et al.'s study indicate that anxiety may not be influenced in the same manner by modeling interventions, as with the types of phobias investigated in Bandura's research (Bandura & Adams, 1977; Bandura, Adams & Breyer, 1977; Bandura et al. 1980). Contrary to the present study's findings, the participants in Bandura's research demonstrated extreme avoidance behaviors and modeling interventions seemed to have a positive influence on decreasing these phobias.

It is important to note that I am not discounting the possible influence of anxiety levels on the self-regulation of learning, as this variable may still be an influencing factor in the learning of motor skills where anxiety is an issue. It is likely that there exists a number of motor skills where anxiety levels are a problem for learners. For instance, future research may wish to examine anxiety with children learning to dive, jump, or scuba dive in the water.

Goal Setting

According to Zimmerman's (1998; 2000) theory of self-regulated learning, goal setting is an important component that influences the three cyclical phases of his theory. Goal setting is an essential component of the learning process because it is a method that can be employed by learners to assess their learning progress. This is accomplished by comparing performances to pre-determined goals. Goal setting issues are most prolific during the forethought phase of the self-regulation of learning. Schunk (2001) proposed that the types of goals that are set in this phase influence how a learner self-regulates because these goals impact self-efficacy beliefs, performance achievement, and self-judgments.

There exists an abundance of literature on goal setting in sport and academic learning (see Burton, 2001 for a review). Generally, researchers acknowledge learners set goals according to three main properties, specificity, proximity, and difficulty level (Bandura, 1988). For the current study I focused on collecting information from participants on the specificity and proximity of their goals. In terms of the specificity of the goal, Schunk (2001) indicated the necessity to determine whether or not the goal is general or specific. The significance of this is obvious, as it is much easier to work towards specific goals as one's progress is more observable. An example of a specific goal is, "I want to be able to lift my arms all the way out of the water". In contrast, a general goal such as, "try your hardest," is more difficult to assess.

On top of whether a goal is specific or general in nature, researchers have indicated the importance of further identifying the proximity of the goal. From this research, two types of goals have been identified as being most commonly set by learners; these include process and outcome goals (synonymous with the classification of proximal and distal goals). While the exact terms used to describe these two types of goals may differ in the goal setting literature, their definitions are basically the same. Process goals are realistic goals that are attainable in the short-term; they refer to the steps involved in obtaining a larger goal. In the context of swimming, a process goal could be striving to swim ten meters without stopping. Outcome goals are considered long-term goals that are more difficult to attain, such as having the goal of passing the next level in swimming lessons (Bandura, 1997).

The goal setting literature has long promoted that process goals are more valuable than outcome goals for encouraging goal commitment and attainment (Locke & Latham, 1990). The reasoning behind this lies with the learner's self-efficacy beliefs. When learners achieve goals that they have set, it raises their belief in their competency or self-efficacy towards skill performance. Bandura's (1997) theory of self-efficacy indicates that past performances are the most potent source of self-efficacy information for learners. Therefore, if the learners' past performance involved reaching a pre-set goal, then their self-efficacy beliefs are more likely to be positively influenced, than if they had yet to reach their outcome goal. Taking the two factors together, it would appear that setting specific proximal goals would be most effective for learners, while general outcome goals would be least valuable to the learning process.

Support for this has been show by Bandura & Schunk (1981) who compared the effectiveness of process, outcome, and general goals on learners' self-regulated problem solving, self-efficacy beliefs, and achievement towards the mathematical skill of subtraction. In their study, children were divided into three groups. One group was given the process goal of completing a set of materials from their mathematics workbook each session, another group was provided with an outcome goal of completing all the workbook material by the end of the last session and the final group was given the general goals of working productively during the lessons. The results determined that the process goal group demonstrated the greatest self-regulatory practice, higher self-efficacy beliefs, and greater subtraction abilities when compared to the children who were in the outcome goal group and the general goal group.

It is important to note that in Bandura and Schunk's (1981) study, they provided the participants with pre-set goals; however, subsequent research promotes the importance of allowing learners to set their own goals. This makes sense because in real-life settings, learners are not told what their goals are; they are expected to determine these themselves. This is also supported in Schunk's (1985) study with children who were having difficulty learning mathematics. These children were separated into three groups. Before the study began, one group was asked to set their own process goals, another group was given pre-determined process goals, and the third group did not set or receive goals. The children who were given or had pre-set goals indicated greater motivation during the practice of mathematical skills as compared to the group that did not have any goals. Furthermore, the children who were given the opportunity to choose their own process goals were more effective at attaining the goals and indicated greater self-efficacy beliefs than the group that were given pre-determined goals. Therefore, in the current study the children were not given goals to work towards, instead they were asked to self-select their own goals. The participants, however, were not told whether or not they should set specific or general, process or outcome goals.

The purpose for assessing participants' goal setting in the current study stems from the desire to compare how the self-as-a-model interventions influence the types of goals that are set by the participants. Thus, the research question for the goal setting measure was whether the self-as-a-model interventions encourage children to set specific and process goals. As this idea had yet to be examined in the literature, the introduction of this measure was exploratory, therefore, no specific hypotheses were put forth.

Procedures

In order to assess the types of goals that each participant set for him/herself, each participant was asked, before every intervention session (six in total), what his/her goals were. More specifically, the children were asked "for your swimming stroke, what do you hope to accomplish?" The participants were posed this question subsequent to viewing their respective videos and completing the psychological measures, but prior to engaging in the swimming lesson. The researcher recorded on paper the participant's self-reported goals.

To evaluate the types of goals set by the children, two independent raters labeled a 30% portion of the participants' self-reported goals as process or outcome goals. Only process and outcome goals were first coded, as this is the main dimension discussed in Zimmerman's (1989, 2000) theory of self-regulated learning. Following this, the raters met and decided that the goals should not only be coded as process or outcome, but also as specific and general, resulting in four goal type categories (specific process, general process, specific outcome, and general outcome). Once the scoring procedure was refined, each rater labeled 100% of the goal setting data and confirmed that the goals were being scored in the same manner (refer to Table 12 for definitions and examples of each type of goal). The two independent raters that scored the participants' self-reported goals achieved an acceptable level of inter-rater reliability, as a Pearson Correlation of .9 was found. The two raters' scores were averaged and it was this average that was entered in the analyses.

Table 12

Examples Illustrating the Four Categories of Goal Setting

Type of Goal	Definition	Example
General Process	Short-term goal involving the improvement of a component of the swimming stroke	"I want to get better at kicking"
Specific Process	Short-term goal involving exactly how they would like to improve a component of the swimming stroke	"I want to be able to kick harder"
General Outcome	Long-term, final goal	"Get better overall to be able to pass Level 6"
Specific Outcome	Long-term, final goal specifically about the stroke.	"To be able to do the breaststroke perfectly"

Results

The goal setting results were compared to assess if any statistical differences emerged between the three experimental groups in terms of the types of goals that were set before each of the intervention sessions. To accomplish this, a 3 (Group) X 2 (Goal Specificity -Specific or General) X 2 (Goal Proximity-Process or Outcome) X 6 (Session) analysis of variance (ANOVA) with repeated measures on the last three factors was computed. This ANOVA did not show any differences between the three groups, F $(2,30) = 1.3$, $p = .3$ $\eta^2 = .08$. A main effect was found, however, for both goal types.

There were significant differences between the number of specific versus general goals that were set, $F\,(1,30) = 10.7, p = .003, \eta^2 = .3$ and between the number of process versus outcome goals, $F\,(1,30) = 6.8, p = .014, \eta^2 = .2$. Tukey post hoc testing revealed that the participants set a significantly greater number of general goals as compared to specific goals. Furthermore, significantly more outcome goals were set when compared to process goals (see Table 13). Due to the small number of goals, it was deemed easier to view the findings by converting the goal setting data into percentages. To do this, the number of goals in each category was divided by total number of goals (see Table 13).

Table 13

Mean Number (M) and Mean Percentages (M %) for the Goal Setting Measure across the Three Experimental Groups

	Self-Modeling *n*=11	Self-Observation *n*=11	Control *n*=11
General			
M	4.6	5.5	5.4
M%	30.5	33.8	36.1
Specific			
M	3.1	3.0	1.7
M%	18.8	15.9	11.9
Outcome			
M	5.0	6.5	7.1
M%	32.8	39.2	47.7
Process			
M	3.0	2.0	0.5
M%	18	11	4.3

Discussion

It is important to note that for the current study I decided to examine the specificity and the proximity of the goals set by the learners. Generally, past research has focused on investigating one or the other; however, I determined that the goal setting data would be more complete if I examined both types of goal properties. As a result we decided to score each goal as being specific or general and process or outcome. Therefore, there were four types of goals that could be set by the participants, specific process goals, general process goals, specific outcome goals, and general outcome goals.

The influence of modeling on the self-regulatory process of goal setting in the learning of motor skills had not been examined before in the research. As a result, the findings from the current study are quite exploratory. It seems that regardless of the experimental group, the majority of the children's goals were in the general and the outcome categories. Even though no statistically significant differences between experimental groups were found, the findings do point towards an interesting trend, that self-as-a-model interventions may have an impact on the types of goals that learners set. It is obvious by glancing at Table 13 that a higher percentage of goals in the specific and process goal categories were observed for the self-modeling (M = 36.8%) and self-observation (M = 26.9%) groups when compared to the control group (M = 16.2%). It is possible that the self-modeling and the self-observation interventions had the same impact on the types of goals set by young swimmers. The control group, on the other hand, appeared to have the bulk of their goals in the general and outcome categories, with very few in the specific and process categories. Perhaps, this signifies that the self-as-a-model interventions provided information to the children that enabled them to set a higher frequency of specific and process goals as compared to the control group. Further research would be needed to confirm this hypothesis.

It is interesting that the largest percentage of the children's goals fit into the outcome and general goal categories, with self-modeling at 63.3%, self-observation with

73%, and the control group with 83.8%. Thus, these children in the 6 to 10 year age group were more concerned with outcomes and set more general goals. Setting general and/or outcome goals can be unproductive because general goals provide little basis for regulating one's efforts and outcome goals are too far away to serve as favorable indicators of progress (Bandura, 1997). It is feasible that the self-as-a-model interventions were effective at modifying the children's focus on outcome and general goals to include process and specific goals. This is an important finding as the literature has shown the importance of setting specific process goals as opposed to general outcome goals for increasing learners' self-efficacy beliefs and performance outcomes (e.g., Zimmerman & Kitsantas, 1996; 1997).

According to Zimmerman's theory of self-regulated learning (1989, 2000), other mechanisms involved in the self-regulation of learning (e.g., self-efficacy, motivation, and self-satisfaction), along with physical performance, are related to the type of goals that are set. This relationship is suggested by the cyclical nature of Zimmerman's theory. Therefore, future research may aspire to develop a research design that is conducive to examining participant's goal setting in order to compute the strength of the relationships among the self-regulatory mechanisms and physical performance according to the modeling intervention. To accomplish this, researchers could assign pre-set goals to participants or group participants according to their overall self-selected goals. In addition, a larger sample size would be required to compute regression analyses. This design would enable researchers to investigate precisely how the self-as-as-model interventions influence goal setting.

CHAPTER 5 - Elaborated Discussion

The primary purpose of this chapter is to provide a link between each chapter's findings and to summarize and conclude the overall dissertation findings. In addition, this chapter includes sections on the strengths and limitations of the project, how the project advances the knowledge base in the area, implications of the findings, and finally, suggestions for future research directions.

Summary and Conclusion of Findings

The findings from this research were separated and discussed in the three previous chapters. In chapter two the impact of the self-as-a-model interventions in terms of Zimmerman's theory of self-regulated learning was examined. Chapter three focused on the data obtained from the think-aloud component of the project and, finally, chapter four investigated the results from the anxiety and goal setting measures. At this point it is necessary to summarize the main findings from each of the three chapters, and link these findings together in order to develop a global conclusion of the results from this dissertation.

By returning to the research questions posed at the outset (chapter one), it is possible to evaluate what was originally hypothesized and what was ultimately discovered. In the following section the research questions are described along with the hypotheses that were put forth. In addition, a brief overview of the findings and whether the hypotheses were supported is also provided.

Research Questions Revisited

1) What are children thinking about while viewing self-as-a-model videos?

No specific hypotheses were forwarded for the exploratory phase of the think-aloud data analyses, as this type of data had not been collected with children before. I did anticipate, however, that there would be differences between the thought processes verbalized by the children in the self-modeling group when compared to the children in the self-observation group.

By employing a think-aloud protocol in the current project I was able to assess children's thought processes while they were viewing self-modeling or self-observation videos. The findings from this measure were presented in the article entitled "Cognitive processes during self-as-a-model intervention: What are children thinking about?" In summary, the children's verbalizations showed that they engaged in a variety of thought processes while viewing self-as-a-model videos. The children were using the self-modeling and self-observation videos to gain information about their skill performances. More specifically, the children's verbalizations were separated into 11 different themes, with three of these themes being the most prolific (Descriptive Positive, Descriptive Negative, and Prescriptive). These three themes referred to both positive and negative observations regarding their skill execution, as well as suggestions for the improvement of future performance attempts. These findings reinforce Bandura's (1977; 1896; 1997) social cognitive theory, in that the children were using the self-as-a-model interventions as a source of feedback to gain information about skill acquisition.

For the confirmatory phase of the think-aloud data analyses, I expected to show differences in the types of verbalizations between the self-modeling and self-observation groups, interestingly, the results did not show any differences. The verbalizations recorded from the children in the self-modeling group were very similar to the children in the self-observation group, thus not supporting the general hypothesis for this measure. It seems that viewing oneself perform to the best of his/her ability or viewing oneself perform with error errors results in the same thought processes. A possibility for this finding could have been that the self-modeling videos and the self-observation videos were not distinct. A manipulation check, however, discovered that the self-as-a-model videos were easily identifiable as being self-modeling or self-observation videos. As a result, these findings warrant further investigation into the thought processes during self-as-a-model interventions.

2) What is the impact of self-modeling, self-observation and practice alone on children's swimming performance, anxiety levels, and self-regulation of learning?

I hypothesized that the self-modeling group would demonstrate superior swimming performance, lower anxiety levels and indicate higher scores on the measures assessing the self-regulatory processes (stronger self-efficacy beliefs, greater intrinsic motivation, and greater self-satisfaction) as compared to both the self-observation and the control groups. Furthermore, I anticipated that the self-observation group would demonstrate superior swimming performance and indicate higher scores on the measures evaluating the self-regulatory processes as compared to the control group. No specific hypotheses were set for the goal setting measure, although differences among the groups were expected.

The article entitled "Investigating the impact of self-as-a-model interventions on the children's self-regulation of learning and performance of swimming skills", examined the impact of a self-modeling intervention, a self-observation intervention and practice alone on the self-regulatory processes of self-efficacy, motivation, and self-satisfaction, as well as physical performance. The relationships among these variables were also assessed. The findings indicated that the participants in the self-modeling group exhibited superior swimming performance and also showed stronger self-efficacy beliefs, greater intrinsic motivation, and more self-satisfaction, as compared to the self-observation group and the practice only control group. It is apparent that the first hypothesis was supported, as the self-modeling group indicated higher scores on these measures as compared to the other two groups. There were, however, no differences between the self-observation group and the control group on all these variables. Thus, the secondary hypothesis of the self-observation group indicating higher scores than the control group was not supported by our findings.

Physical performance was also assessed with the inclusion of a recognition test. This type of measure allows researchers to determine if the intervention had an influence on learners' ability to detect skill errors and subsequently make corrections. It was anticipated that the same pattern of findings as for the physical performance data would also be found for this measure. This was not the case, however, as all experimental groups performed similarly on the recognition test.

Chapter four contained a description and discussion of the findings from the anxiety and goal setting measures that were not included in the above-mentioned articles. It appeared that the children's anxiety levels were not influenced by the self-as-a-model interventions. In fact, the children did not show evidence of anxiety from the outset of the study, and as a result a floor effect occurred. This revealed that the swimming skills chosen were not fear enhancing skills and, therefore, anxiety was not likely an influencing variable. Thus, I was unable to test the hypothesis that anxiety would play an influencing role in the self-regulation of children's learning of swimming skills.

For the goal setting measure, no hypotheses were set, due to the novel introduction of this measure in the self-as-a-model research. The findings indicated that regardless of the experimental group, the majority of the children's goals were in the general and the outcome categories. Even though no statistically significant differences between experimental groups were found, the findings do point towards an interesting trend, that self-as-a-model interventions may have an impact on the types of goals that learners set. The self-modeling and self-observation groups had a higher percentage of goals in the specific and process categories when compared to the control group. The self-modeling and the self-observation interventions, however, had a very similar impact on the types of goals set by young swimmers. The control group, on the other hand, appeared to have the bulk of their goals in the general and outcome categories, with very few in the specific and process categories. This signifies that the self-as-a-model interventions provided information to the children that enabled them to set a higher frequency of specific and process goals as compared to the control group.

3) What is the strength of the relationship among: a) the intervention and the dependent variables, b) physical performance and the self-regulatory processes, and c) among the self-regulatory processes?

I hypothesized that: a) the intervention would be strongly correlated with all dependent variables, b) that physical performance would show a strong relationship with all self-regulatory processes, and c) that the self-regulatory process would all be highly correlated. The findings revealed that a strong positive relationship was present between the intervention and the dependent variables. Furthermore, a strong positive correlation existed between all the self-regulatory mechanisms and physical performance. The findings also showed that a strong positive correlation among the self-regulatory mechanisms was present, with the exception of self-efficacy and motivation.

Linking the Research Questions

Collectively, the findings from the three chapters do provide strong support for the use of self-modeling interventions with children learning swimming skills. Referring back to Zimmerman's (1989, 2000) theory of self-regulated learning I propose that the self-modeling intervention was effective in the current study because it had a positive impact on the processes involved in the self-regulation of learning, which in turn resulted in greater physical performance outcomes.

Surprisingly, however, there was little support for the use of self-observation interventions. The self-observation intervention did not have a significant effect on learners' self-regulatory processes and physical performance outcomes when compared to practice alone. This is even more surprising when considering the verbalizations made by the children in the self-modeling group and the self-observation groups, unexpectedly there appeared to be few differences between the two groups' think-aloud verbalizations. This was unexpected because the self-modeling and self-observation groups viewed videos containing different types of information about their skill performance.

This observed similarity between the self-observation group and the control group may have been caused by the fact that the study only tapped into what the children were thinking while viewing the self-as-a-model videos and not their feelings associated with viewing themselves on video. This is important because we have stressed the importance of the relationship between psychological variables such as self-efficacy, motivation and self-satisfaction and physical performance outcomes. These findings suggest that self-modeling and self-observation interventions may evoke more affective responses (i.e., have a greater influence on self-efficacy beliefs) on the part of the learner as compared to informational responses (as with the think-aloud protocol). As a result, perhaps the differences in terms of the information obtained from these interventions were more interpretable through measures investigating the self-regulatory processes and physical performance. Consequently, the value of including a variety of measures (both qualitative and quantitative) was clearly supported by the findings. Incorporating both qualitative and quantitative components in the current study added scope and breadth to the findings; in addition this also allowed a convergence of the results (Greene et al., 1989).

Strengths and Limitations

Strengths

The current study consists of a number of strengths that merit mentioning. Overall, this dissertation has successfully expanded the research on self-as-a-model interventions. The most noteworthy strength lies in the fact that the study operated within a strong theoretical framework. Working from Zimmerman's (1989, 2000) theory of the self-regulation in learning, allowed for greater insight into why self-as-a-model interventions are effective learning techniques. Additionally, the current study not only assessed which types of self-as-a-model interventions were most effective, but also tapped into the underlying processes that are involved with the use of this teaching technique.

Additional strengths have to do with the experimental design. First, the length of the intervention can be considered a strong component of the study, as it spanned eight days, which is longer than most other self-as-a-model studies. This duration was evaluated as the ideal number of sessions for a variety of reasons. For example, it is the same number of lessons that are in a Red Cross Water Safely swimming session. In addition, by the last session the participants still appeared to be engaged by the project and were still focused on working towards the improvement of their specific swimming stroke. The fact that the current research was carried out over eight-days allowed for an assessment of the pattern of findings for the dependent variables across the sessions. For example, the findings showed that all participants' self-efficacy beliefs increased across the sessions during the course of the study.

A second strength of the project lies in the number of measures that were assessed. A calculation of all variables assessed resulted in a total of eight measures and these included: anxiety, self-efficacy, motivation, self-satisfaction, goal setting, physical performance, think-aloud protocol, and the recognition test. Generally, studies examining self-as-a-model interventions only include one or two of the previously mentioned variables; however, in doing so they eliminated the possibility of obtaining a clear picture of all factors involved in self-as-a-model interventions. Finally, the study took place in a naturalistic, real-life setting; therefore, the results are more generalizable to other motor skill learning settings.

Limitations

As with any study, this research does have limitations that are necessary to identify. The main limitation of the study is related to the examination of the self-modeling process within the social-cognitive theory of self-regulated learning. The self-regulation of learning is a complex process with many different influencing mechanisms and, as such, measuring all of these mechanisms was beyond the scope of this study. Therefore, in order to increase the feasibility of the research, I focused on processes involved in the forethought phase (self-efficacy, motivation and goal setting) and one component of the self-reflection phase (self-satisfaction).

Another limitation stems from the fact that I deemed it necessary to ensure that the participants were motivated to learn the swimming skill that they would be practicing for the intervention. To meet this requirement I allowed the children to choose a swimming skill that they perceived as important to learn. In addition, it had to be a skill that we determined that they could not perform properly consistently. As a result, not all the children practiced the same swimming strokes, which decreased the level of control for the study.

The age range and genders of the participants in the study may also be considered a limitation as the ages of the participants ranged from 6 to ten years old and the gender distribution was uneven. Although, I did confirm that age and gender were not factors in any of the analyses. Furthermore, the fact that the measure used to assess the children's recognition performance appeared to be flawed is an additional limitation. Due to this, the findings pertaining to children's development of error detection and correction mechanisms are weak.

Finally, although the present study included a larger number of participants than most self-modeling studies, it is still a fairly small sample size. This sample size limits extensively the nature of the statistical analyses that can be performed with the data. Had I been able to recruit additional participants, it would have allowed for testing of a mediational model using multiple regression techniques.

Contributions to the Knowledge in the Area

This doctoral dissertation adds much to our knowledge of self-as-as-model interventions and their impact on self-regulatory processes and physical performance outcomes. First, self-as-a-model interventions had yet to be examined using Zimmerman's (1989, 2000) social-cognitive framework of self-regulated learning and, consequently this research provided a new perspective in which to investigate self-as-a-model research. Second, by using Zimmerman's theory this research provided insight into the understanding of a few of the self-regulatory mechanisms that are involved in learning by viewing the self-as-a-model. The self-modeling intervention increased the learners' self-efficacy beliefs, intrinsic motivation, self-satisfaction and physical performance.

Also notable are the contributions that the study's findings offer to the understanding of the thought processes involved in observing self-as-a-model videos. This research provided a comprehensive picture of the characteristics of modeling by providing researchers with a framework of the types of information that children gather from watching themselves perform motor skills on video. This is important because in the past it was often assumed that observers were gathering information from a demonstration. Overall, these contributions will provide information to educators so that they are able to more effectively use self-as-a-model interventions as a teaching technique.

Implications

The findings from the current study have interesting implications for a variety of settings that involve the learning of motor skills. From a practical point of view, individuals who are teachers, coaches, physiotherapists, or occupational therapists would benefit from the knowledge of the findings. Professionals in many of these occupations are known to implement self-observation interventions (see Dowrick, 1999). It is apparent that self-observation interventions are much less time consuming and are not nearly as labor intensive as compared to a self-modeling intervention. These research findings, however, show that self-observation does not appear to be as effective when compared to self-modeling. Since time is always a limiting factor in the above mentioned professions, it does not seem worthwhile to take the time to show self-observation videos to learners, as according to the current study's findings it does not appear to be more effective than practice alone. In these areas where improving motor skills is so important, if practionners wish to use video feedback, it would seem that this study's findings point towards the importance of taking the extra time and effort in order to develop a self-modeling intervention.

Future Research Directions

As it will be illustrated in this section, there exist many exciting areas for future research with self-as-a-model interventions in many different contexts and with a variety of populations. The sample in the current study consisted of children; however, there is the possibility that the learning process involved may not be the same for the two samples. Actually, Ferrari (1996) has indicated that a learner's age is a variable that can influence how one learns by observation and thus it is important to determine whether differences do exist. As a result, it would be of interest to discover whether or not the same pattern of results would emerge for both children and adults. This suggestion is presently under investigation. Future research may also be interested in examining the possible developmental and gender differences that might be involved when children engage in self-as-a-model interventions. It is likely that differences in the impact of self-as-a-model interventions would exist between younger children and older children, as well as, between girls and boys because previous modeling research has shown that differences were present (Weiss, 1983; Weiss & Klint, 1987; Weiss, Ebbeck & Rose, 1992).

A number of suggestions can be proposed to improve the usefulness of the recognition measure for future research. In terms of the recognition measure, the findings suggest that the children's ability to distinguish between adequate and error performances was not exceptionally high, suggesting that for some reason the self-as-a-model interventions did not have the anticipated positive impact on children's error detection and correction mechanisms (Bandura, 1977, 1986, 1997). Future research would want to discern if this is in fact the case or if other variables influenced this finding, such as the quality of the recognition clips. Furthermore, the children's ability to identify all four errors in the error recognition clip was the same among the groups and on average the children only identified one and a half errors out of a possible four. Perhaps this occurred because we did not inform the children that they should look for four errors, the researcher simply informed them to identify all errors they noticed. As a result, this task may not have been as clear as required for young children. With young children it may be more appropriate to use a more sensitive and age appropriate measure, perhaps one that only expects children to identify one error.

A self-modeling intervention has been determined to be effective in a swimming environment; however, this effectiveness may not be evident in other sports. As a result, future research should investigate self-as-a-model interventions in additional sport contexts. The undertaking of this next step is necessary because it is possible that self-as-a-model interventions may impact learning in a different manner due to the nature of a particular sport. For example, continuous activities (such as swimming and running) versus discrete activities (such as figure skating and gymnastics) have different goals and outcomes. Thus, the inherent characteristics found in every sport will likely influence how self-as--model interventions function and, consequently the results that are obtained.

For the present study I was interested in the impact of the self-as-a-model interventions in a motor learning situation, however, the competitive environment is a possible context for future research. In a competitive situation, the physical performance outcomes would likely be more focused on placement or achieving a best time, although this would depend on the sport. Even though the desired physical performance outcomes in a competitive sport environment may be different, the same self-regulatory mechanisms would certainly be involved, as it is well known that such psychological variables such as self-efficacy and anxiety influence athletes' competitive performances (Feltz & Chase, 1998; Vallerand & Fortier, 1998). Recently, I examined self-modeling with competitive swimmers and discovered that a self-modeling intervention enabled the swimmers to set goals that were close to their actual performance times (Clark & Ste-Marie, 2003). This study did not compare the differences between self-modeling and self-observation interventions, thus leading to this interesting area for future research.

Aside from the sport context, it would be interesting for researchers to examine the use of self-as-a-model interventions in the rehabilitation environment. Many physiotherapists and occupational therapists use video feedback, therefore, it would be appealing to discover when and how self-as-a-model interventions are being used in this context. Moreover, a comparison of self-modeling and self-observation could also be worthwhile in the rehabilitation setting.

The current study is one of only two to date that have employed a think-aloud protocol with self-as-a-model interventions. Both the current study and Ram & McCullagh's (2003) study examined participants' thought processes while viewing the self-as-a-model videos. Specifically, they were asked to verbalize everything that came to mind while watching themselves on video. It would be interesting for future studies to have participants engage in a self-as-a-model intervention, but instead request that they verbalize all thoughts related to how they felt while performing the physical skill. This technique would enable researchers to tap into the self-monitoring component of the performance control phase of Zimmerman's (1989, 2000) theory of self-regulated learning. In addition to the self-monitoring component, as a last direction for future research, it would seem worthwhile to incorporate the components of self-regulated learning that were not examined here in order to fully understand the impact of self-modeling on the self-regulation of learning. For example, goal orientation, self-reactions and self-judgments are other self-regulatory processes that would be interesting to investigate.

In conclusion, it appears that the social cognitive theory of self-regulated learning (Zimmerman, 1989, 2000) is an effective framework from which to investigate self-as-a-model interventions. This dissertation has provided insight into how and why self-modeling is such a valuable teaching technique for children learning motor skills. As with most research, this dissertation not only attempted to answer the pre-determined questions, but in doing so many research directions for future research have also emerged.

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APPENDICES

Appendix A

Contributions of Collaborators

Dr. Diane Ste-Marie and I met on several occasions to solidify the purpose of the study, the methodology, and the proposed data analyses. I began writing the thesis proposal and submitted drafts to Dr. Ste-Marie who made comments, suggestions and revisions. After the completion of the thesis proposal, minor changes were made to the literature review upon suggestions from the thesis committee members, Dr. Brad Cousins, Dr. Raymond Leblanc and Dr. Rose Martini. The methodology was also changed according to comments made by the thesis committee.

I collected and entered all data. Dr. Ste-Marie and I met on several occasions to discuss and determine the appropriate analyses for the qualitative and quantitative data. Afterwards, I conducted the data analyses and then interpreted the results. The interpretation was also discussed with Dr. Ste-Marie. I wrote all sections of the thesis, however, after completing each section of the thesis, they were read and edited by Dr. Ste-Marie. In addition, Dr. Martini provided additional comments and suggestions with regards to the second article, "The cognitive processes underlying self-modeling and self-observation: What are children thinking about?"

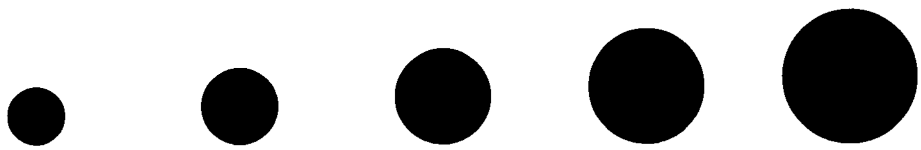
Finally, a complete draft of the thesis document was circulated to the thesis committee members and changes/revisions were made to the document as requested by the thesis committee before the submission of the thesis to the Faculty of Graduate and Post Doctoral Studies.

Appendix B

Self-Efficacy Measure for Children

I want you to think about how you feel about being able to successfully do a **{insert skill here}**, and then point to the circle that best describes how you feel about being able to do the **{insert skill here}.**

Don't feel very good				Feel okay				Feel very good	
1	2	3	4	5	6	7	8	9	10



Appendix C

Motivation Orientation in Sport Scale (MOSS) –Challenge Sub-Scale

Really true for me	Sort of true for me			Really true for me	Sort of true for me
		Example: Some kids would rather play outdoors in their spare time **BUT**	**Example**: Other kids would rather watch TV		
		Example: Some kids like hamburgers better than hotdogs **BUT**	**Example:** Other kids like hotdogs better than hamburgers		
		Some kids like hard swimming skills because they're a challenge **BUT**	Other kids prefer easy swimming skills that they are sure they can do		
		Some kids like difficult swimming skills because they enjoy trying to become good at them **BUT**	Other kids don't like to try difficult swimming skills		
		Some kids like to try new swimming skills that are more difficult to do **BUT**	Other kids would rather stick to swimming skills which are pretty easy		
		Some kids like swimming skills that are pretty easy to do **BUT**	Other kids like those swimming skills that make them work hard to be good		
		Some kids don't like difficult swimming skills because they have to work to hard **BUT**	Other kids like difficult because they find them more challenging.		

Appendix D

State-Trait Anxiety Inventory for Children

STAIC FORM C-1

NAME ______________________________ AGE ________ DATE ____________

DIRECTIONS: A number of statements which boys and girls use to describe themselves are given below. Read each statement carefully and decide how you feel *right now.* Then put an X in the box in front of the word or phrase which best describes how you feel. There are no right or wrong answers. Do not spend too much time on any one statement. Remember, find the word or phrase which best describes how you feel right now, *at this very moment.*

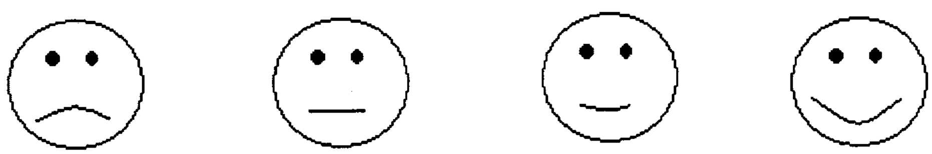
1.	I feel	☐ very calm	☐ calm	☐ not calm
2.	I feel	☐ very upset	☐ upset	☐ not upset
3.	I feel	☐ very pleasant	☐ pleasant	☐ not pleasant
4.	I feel	☐ very nervous	☐ nervous	☐ not nervous
5.	I feel	☐ very jittery	☐ jittery	☐ not jittery
6.	I feel	☐ very rested	☐ rested	☐ not rested
7.	I feel	☐ very scared	☐ scared	☐ not scared
8.	I feel	☐ very relaxed	☐ relaxed	☐ not relaxed
9.	I feel	☐ very worried	☐ worried	☐ not worried
10.	I feel	☐ very satisfied	☐ satisfied	☐ not satisfied
11.	I feel	☐ very frightened	☐ frightened	☐ not frightened
12.	I feel	☐ very happy	☐ happy	☐ not happy
13.	I feel	☐ very sure	☐ sure	☐ not sure
14.	I feel	☐ very good	☐ good	☐ not good
15.	I feel	☐ very troubled	☐ troubled	☐ not troubled
16.	I feel	☐ very bothered	☐ bothered	☐ not bothered
17.	I feel	☐ very nice	☐ nice	☐ not nice
18.	I feel	☐ very terrified	☐ terrified	☐ not terrified
19.	I feel	☐ very mixed-up	☐ mixed-up	☐ not mixed-up
20.	I feel	☐ very cheerful	☐ cheerful	☐ not cheerful

Appendix E

Self-Satisfaction Questionnaire for Children

Please point to the number below that best shows how good you feel about your performance of the **{insert skill here}.** You can use the happy faces to know what each number means.

1 2 3 4 5 6 7 8 9 10



Appendix F

Ethics Approval

Université d'Ottawa · University of Ottawa

Cabinet du vice-recteur à la recherche
Office of the Vice-Rector, Research

HEALTH SCIENCES AND SCIENCE RESEARCH ETHICS BOARD

CERTIFICATE OF ETHICAL APPROVAL

This is to certify that the University of Ottawa Health Sciences and Sciences Research Ethics Board has examined the application for ethical approval for the research project **Investigating the mediating mechanisms of self-modeling (File H 05-03-06)** submitted by Shannon Clark, supervised by Diane Ste-Marie. The Board found that this research project met appropriate ethical standards as outlined in the Tri-Council Policy Statement and in the Procedures of the University of Ottawa Research Ethics Boards, and accordingly gave it a Category 1a (approval). This certification is valid for one year from the date indicated below.

Andrée Bertrand
Protocol Officer for Ethics in Research,
For the Chairperson of the Health
Sciences and Science REB
Daniel Lagarec

July 14th, 2003
Date

Appendix G

Swimming Scoring Sheets

Swimming Scoring Sheet – Front Crawl

Front crawl	**Consistent 3**	**Fairly Consistent 2**	**Inconsistent 1**	**Not completed 0**
Keeps elbows high during recovery and pull. **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Maintains horizontal body position, keeping head straight **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Rolls body on long axis with no hip sway **(Usually they don't do this)**				
Flutter kicks from the hips, toes pointed **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Extends hand entry toward forward of head and in line with the shoulders **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Executes bent arm pull in S pattern **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Accelerates hands through the pull **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Extends pull past hips **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Exhales under water breathes to side as needed (no pause) **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Co-ordinates relaxed breathing with alternating				

relaxed arm recovery above water **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Keeps fingers together when pulling **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Turns head to the side to side when breathing and promptly puts head back in the water **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Arms are rotated at an equal and consistent speed **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Recovers arms in opposition, no double arm pull **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				

TOTAL SCORE: /42

Note: Criteria listed are part of the Red Cross Water Safety Program guidelines, with the exception of the italicized items.

Swimming Scoring Sheet-Back Crawl

Back Crawl	**Consistent 3**	**Fairly Consistent 2**	**Inconsistent 1**	**Not completed 0**
Accelerates arms and hands through the pull **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Maintains near horizontal body position with neck in line with spine **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Rolls body from side to side leading with shoulders and keeping head stationary **(They usually don't do this properly)**				
Flutter kicks in a continuous manner with toes pointed. **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Kicks from hips knees below surface **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Recovers arms above water in opposition **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Recovers arms in a straight and relaxed manner with no pause **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Enters hands, catching the water at 11:00 and 1:00 positions **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Uses bent arms pull in an S/question mark pattern, keeping elbows high **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Extends pull past the hips **All the time: Consistent**				

Does not do it once: Fairly consistent **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Breathes in a relaxed manner **(need to look at face for this one)** **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Co-ordinates body roll with arm recovery **(They don't often do the body roll)**				
Baby finger of hand enters the water first **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Keeps head back and ears in the water **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				

TOTAL SCORE: /42
Note: Criteria listed are part of the Red Cross Water Safety Program guidelines, with the exception of the italicized items.

Swimming Scoring Sheet – Breaststroke

Breaststroke	**Consistent 3**	**Fairly Consistent 2**	**Inconsistent 1**	**Not completed 0**
Body/head remain at or near the surface **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Recovers legs symmetrically (both legs at the same time) by bending hips and knees **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Pulls heels toward the buttocks while separating knees just wider than hips, ankles slightly outside knees **If one part of sequence not done: Fairly consistent** **If two parts are not done: Inconsistent** **If not done at all: Inconsistent**				
Flexes ankles and rotates feet outward **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Whips feet and lower leg back (power phase) to glide position with toes pointed **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Legs accelerate through power phase **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Presses extended arms/palms apart slightly wider than shoulders **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Bends elbows and sweeps the forearms and hands downward and towards chest **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Hands sweep together under the chin, keeping the elbows forward of shoulders **All the time: Consistent** **Does not do it once: Fairly consistent**				

Does not do it twice or more: Inconsistent **Does not do it at all: Not completed**				
Arms accelerate through power phase **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Arms recover forward to full extension **All the time: Consistent** **Does not do it once: Fairly consistent** **Does not do it twice or more: Inconsistent** **Does not do it at all: Not completed**				
Co-ordinates arm pull and whip kick **(one pull and one kick)**				
Inhales during pull, exhaling during kick (i.e. pull and breathe, kick and glide) **If they miss the glide but do everything else, it is fairly consistent.** **Inconsistent if glide is missing and one other part of sequence is off.** **If it's all wrong: Not completed**				
Glides until forward momentum slows **3 second glide: Consistent** **2 second glide: Fairly** **1 second glide: Inconsistent** **No glide: Not completed.**				

TOTAL SCORE: /42

Note: Criteria listed are part of the Red Cross Water Safety Program guidelines, with the exception of the italicized items.

Elementary Backstroke – Swimming Scoring Sheet

Elementary Backstroke	**Consistent 3**	**Fairly Consistent 2**	**Inconsistent 1**	**Not completed 0**
Body is in horizontal back glide position, face above surface at all times				
Keeps the back, hips, thighs nearly straight just below surface				
Recovers legs symmetrically by bending and separating knees slightly wider than the hips				
Pulls heels beneath and slightly wider than the knees				
Flexes ankles and rotates feet outward				
Whips feet and lower leg back (power face) to glide to position with toes pointed				
Legs accelerate through power phase				
Slides palms slowly up the sides of the body, extends arms slowly out to side and presses hands toward feet as legs kick.				
Arms accelerate though power phase				
Co-ordinates symmetric arm pull with kick, inhaling during recovery and exhaling during power phase				
Glides until forward momentum slows				
Fingers are kept together during "acceleration phase"				
Fingers point away from the body when accelerating (pushing down)				
Arms and Legs accelerate at same time				

TOTAL SCORE: /42

Note: Criteria listed are part of the Red Cross Water Safety Program guidelines, with the exception of the italicized items.

Swimming Scoring Sheet – Butterfly

Butterfly	**Consistent 3**	**Fairly Consistent 2**	**Inconsistent 1**	**Not completed 0**
Moves in a continuous motion with hips remaining near the surface				
Legs kick together from the hips				
Knees lead legs during downbeat of the kick (power phase)				
Keeps toes pointed during kick				
Relaxes arms during recovery				
Extends arms/hands in front of head as they enter the water				
Pulls in a key-hole pattern				
Accelerates through the power phase and pulls past hips.				
Co-ordinates two dolphin kicks with one symmetric arm stroke				
Performs first down kick as arms enter water and second down kick as hands exit water				
Breathes every second stroke				
As the arms finish the pull, the head is tilted up with the chin out				
Head only comes out of the water enough for the chin to rest on the surface of the water				
Arms are kept fairly straight as they recover				

TOTAL SCORE: /42

Note: Criteria listed are part of the Red Cross Water Safety Program guidelines, with the exception of the italicized items.

Appendix H

English and French Consent and Information Forms

Université d'Ottawa · University of Ottawa

Faculté des sciences de la santé
École des sciences de l'activité physique

Faculty of Health Sciences
School of Human Kinetics

Information and Consent Form

The following people are conducting this research. If for any reason you would like to contact us, the following information should provide you with the means to do so:

Shannon Clark, PhD Candidate, Faculty of Education, Phone number: 562-5800 ext. 4248,

Dr. Diane Ste-Marie, Associate Professor, Faculty of Health Sciences, School of Human Kinetics Phone number: 562-5800 ext.5851, dstmarie@uottawa.ca.

The point of this letter is to ask your permission to allow your child to participate in a research project examining the influence of self-modeling and self-observation with children learning swimming skills. The University of Ottawa Gee Gees Summer Camp Director has provided us with the approval to approach the parents that have children registered in the aquatic camp. Please read the following information and indicate whether or not you are willing to allow your child to participate in this study.

Purpose of the study: The purpose of this study is to compare the effectiveness of two teaching techniques (self-modeling and self-observation) and to learn more about how these teaching techniques enhance learning. Self-modeling is the process of viewing oneself on videotape performing a skill perfectly; therefore, all errors are edited out. In contrast, self-observation involves viewing oneself on videotape performing a skill at one's current skill level with error performances remaining on the videotape.

Description of participation requirements: If your permission is granted, your child would participate in eight sessions. Each session would take approximately 30 minutes and these sessions would take place directly before your child's swimming lesson with the Gee Gee's summer camp program. This would be arranged with your child's camp counselor so as to minimize any disruption of the camp activities. In the first session, your child would be asked to perform some swimming skills to determine his/her current swimming ability. After this, one swimming skill will be chosen that your child is unable to perform consistently according to the Red Cross Water Safety Program Standards. Your child would then be randomly assigned to one of three groups. If assigned to the self-modeling group, the skill would be videotaped and the videotape will be edited so that all error performances are gone, therefore, your child would only see him/herself performing perfectly (self-modeling videotape). If assigned to the self-observation group, the skill would be videotaped as well, however, this tape would not be edited and, therefore, your child would see him/herself performing at their current skill level (self-observation videotape). If assigned to the control group, the skill would not be videotaped, however, your child would still participate in the swimming lessons. For the next six sessions, your child would take part in six swimming lessons with a certified swimming instructor who would provide feedback on the three swimming skills chosen. Before each swimming lesson, your child would be asked to view the self-modeling videotape or the self-observation videotape and indicate what information he/she is paying attention to while watching the videotape of him/herself. These verbalizations would be audio-recorded. In addition, your child would also be asked to fill out some questionnaires examining his/her self-efficacy beliefs, anxiety level, motivation and self-satisfaction prior to each swimming lesson. These questionnaires are worded specifically for children. Twenty-four hours following the final swimming lesson, one last session would take place in order to videotape your child performing the swimming skill and to have them fill out the questionnaires one last time. Please note that if your child performs all the skills perfectly form the beginning, we will not need him/her to continue with the study. Your child will be informed of this and we will send a letter home to you indicating that this is why he/she is no longer participating.

Potential risks or discomforts: Since your child will be involved in physical activity, he/she may get tired during the lesson. To minimize this, your child will be given periodic breaks during the swimming lesson. In addition, if your child is a beginner swimmer he/she may feel fearful in the water. To avoid this the swimming instructor will strive to make him/her feel as comfortable as possible by aiding him/her in the water and always remaining close by. Should your child decide not to continue participating, he or she can do so with no fear of any negative consequences.

Potential benefits: The benefits of your child's participation in this research project is that he/she will have the opportunity to receive free swimming lessons, which are focused specifically on the improvement of a swimming skill that they are unable to perform consistently. Furthermore, the results will provide more insight into how these teaching techniques improve swimming skill performance.

Anonymity and confidentiality: Your child will be videotaped for the sole purpose of the researcher reviewing the videotaped to assess swimming proficiency. No one except the researchers above will have access to these tapes. The video and audio recording of the sessions will be kept for five years following publication of the study and then destroyed. The information on the videotapes will remain strictly confidential, as the videotapes will not indicate your child's name. These videotapes will be stored in a locked filing cabinet in a room that is accessed only by the researcher and her supervisor. Anonymity will be assured in the following manner: Only the researcher and her supervisor will have access to the videotapes and the data collection sheets and no names will appear on the data sheets. As well, any published data will be done in a group format only and no individual data will be identified.

If you have any questions about the conduct of the research project, you may contact the researcher or her supervisor at the numbers provided at the top of the page. Furthermore, any concerns about the ethical conduct of this project may be addressed to the Protocol Officer for Ethics in Research at the University of Ottawa, who can be reached at Tabaret Hall, Room 159A, 562-5387. This research is funded by a Social Science Research Council of Canada doctoral fellowship. There are two copies of this consent form, one for you to keep for your records and one for the researcher.

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After having read and understood the above information, please complete the form below. Return the bottom portion signed to your child's camp counsellor and retain the remaining information sheet for your personal records.

I, ________________________________ (parent or guardian's name, please print) have read and understood the request for my son/daughter to participate in this study concerning self-observation and self-modeling. I have discussed it will my son/daughter and (check one of the following).........

_____ I give permission for my son/daughter to participate.

_____ I do not give permission for my son/daughter to participate.

Name of Child (please print): ________________________________ Date of Birth: ________________

Signature of Parent/Guardian and Date: ________________________

Signature of the Reseacher and Date : ________________________

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ADDITIONAL INFORMATION

Due to the fact that this study takes place over eight days, we are looking for children who are attending the University of Ottawa Gee-Gee's summer camp for two consecutive weeks. Your child does not necessarily have to be enrolled in the Aquatic Camp for the two weeks, as it would still be possible to continue with the swimming sessions during the second week even if your child is participating in another University of Ottawa camp program. Please note that all swimming sessions would take place from 8 :30 to 9 :00 am, in order to minimize the disruption of camp activities. In addition, if your permission is granted, you would still bring your child to his/her camp counselor as the swimming instructor would retrieve you child from his/her camp counselor in the morning. If you are interested in the study, please indicate below the dates and camps in which your child will be participating :

Name of child	Week of :	Camp

Université d'Ottawa · University of Ottawa

Faculté des sciences de la santé — Faculty of Health Sciences
École des sciences de l'activité physique — School of Human Kinetics

Formulaire de consentement

La présente recherche est la responsabilité des personnes suivantes. Au besoin, pour quelque raison que ce soit, n'hésitez pas à communiquer avec l'une d'elles.
Shannon Clark, Étudiante de la deuxième cycle, Département d'Éducation, Université d'Ottawa, Téléphone : 562-5800, poste : 424, Courriel :

Diane Ste-Marie, PhD, Professeure agrégée, École des sciences de l'activité physique, Université d'Ottawa, Téléphone : 562-5800, poste : 5851, Courriel : dstmarie@uottawa.ca.

Cette lettre a pour but d'obtenir votre permission afin que votre enfant puisse participer à un projet de recherche examinant les influences de l'observation de soi et 'self-modeling' par l'entremise de vidéos portant sur les habilités de natation. Le coordonnateur du camp Gee Gee's a déjà donné son accord. Son approbation a pour seul but de me permettre d'approcher les parents qui ont des enfants inscrits au camp aquatique. Je vous prie donc de lire le formulaire et d'indiquer si vous êtes en accord ou non que votre enfant participe à cette recherche.

Le But de l'étude : Le but de cette étude est de comparer l'effet de deux techniques d'apprentissage, 'Self-modeling' et l'observation de soi et à quel point ces techniques d'enseignement améliorent l'apprentissage. 'Self-modeling' est le procédé par lequel l'étudiant se voit sur vidéo en train de compléter une tâche parfaitement; par conséquent, toutes les erreurs ont été éradiquées. Par contraste, l'observation de soi est le procédé par lequel l'étudiant se voit sur vidéo en train de compléter une tâche, à son propre niveau, ne supprimant pas les erreurs.

Description des critères de participation : Avec votre permission, votre enfant participera à huit sessions. Chaque session dure approximativement trente minutes et ces sessions auront lieu juste avant la leçon de natation avec le camp d'été des Gee Gee's. Ces arrangement seront pris directement avec le moniteur de camp de votre enfant afin de minimiser toute interférence. Durant la première session, votre enfant devra compléter des tâches de natation afin de déterminer son niveau d'habilité. Après ceci, on choisira trois habilités de natation qui seront difficiles pour votre enfant, selon des standards du programme de la Croix Rouge. Une de ces tâches sera mises sur vidéo et ce vidéo serait édité afin que toutes les erreur soient omises; votre enfant se verrait parfaire cette tâche parfaitement. La deuxième habilité serait aussi enregistrée sur vidéo; cette fois, ce vidéo ne serait pas édité afin que votre enfant puisse se voir tel qu'il est. La troisième habilité ne sera pas mise sur vidéo, cette tâche servira de contrôle. Pour les six sessions suivantes, votre enfant participera à six leçons avec un instructeur certifié, qui donnerait à votre enfant un feedback sur ses trois habilités choisies. Avant chaque leçon de natation, votre enfant devra regarder les vidéos de 'self-modeling' et de l'observation de soi et il devra indiquer quels détails attirent son attention en regardant les vidéos de lui-même; ces commentaires seront enregistrés. En plus, votre enfant répondra à un questionnaire examinant sa perception d'efficacité, son niveau d'anxiété, sa motivation et son niveau de contentement avant chaque leçon de natation. Ces questionnaires sont spécifiquement formulés pour enfants. Vingt-quatre heures après la dernière leçon de natation, une dernière session aura lieu afin d'enregistrer votre enfant, entrain de faire les trois tâches et il devra remplir les questionnaires une dernière fois. Veuillez-noter, qu'au début si votre enfant complète toutes les tâches de natation parfaitement, il ne sera pas nécessaire qu'il ou elle continue cette étude. Votre enfant sera informé de ceci et nous enverrons informer de ceci et nous enverrons une lettre à la maison indiquant la raison qu'il ou elle ne puisse continuer.

Risques possible : Étant donné que votre enfant participera à une activité physique, il ou elle pourra devenir fatigué durant la leçon. Afin de réduire cette possibilité, votre enfant aura différentes pauses durant la leçon de natation. En plus, si votre enfant est débutant, il ou elle pourrait craindre l'eau. Afin d'éviter ceci, l'instructeur de natation fera de son mieux pour mettre votre enfant à l'aise en l'aidant dans l'eau et en étant toujours à ses cotés. Si votre enfant décidait d'abandonner l'étude, il ou elle n'aura pas à craindre des conséquences négatives.

Bénéfices possibles: Les bénéfices de la participation de votre enfant dans ce projet d'étude seront qu'il ou elle aura l'opportunité de recevoir des leçons de natation gratuites, qui porteront spécifiquement sur l'amélioration de trois habilités qu'ils auront de la difficulté à parfaire. En plus, ces résultats jetteront plus de lumière sur ces méthodes d'enseignement.

Confidentialité : Les données recueillies serviront seulement aux fins de recherche et de publication. La confidentialité sera respectée en tout temps puisque le nom des enfants ne sera pas inscrit sur les documents de collecte de données. De plus, les renseignements à publier seront présentés par groupe et non individuellement. On s'assure que les renseignements fournis par mon enfant resteront strictement confidentiels. L'anonymat sera garanti puisque seules Diane Ste-Marie et Shannon Clark auront accès aux données recueillies. De plus, les données sur mon enfant seront détruites au bout des cinq années réglementaires après publication.

Si vous voulez d'autres renseignements au sujet du projet de recherche, vous pouvez communiquer avec les responsables de recherche aux numéros fournis au début du formulaire. Pour tout souci concernant les aspects déontologiques de ce projet, vous pouvez s'adresser à responsable de la déontologie en recherche, au (613) 562-5387. Ce projet de recherche est subventionné par le Conseil de recherches en science humaines du Canada

✂ ....

Après avoir lu et compris les informations, veuillez compléter le formulaire ci-dessous. Veuillez détacher la partie inférieure du formulaire et la retourner dûment remplie aux moniteurs de camp de votre enfant et garder la feuille d'information pour votre dossier personnel.

J'ai discuté de la présente étude avec mon enfant et...

_____ je lui **PERMETS** d'y participer.

_____ je ne lui **PERMETS PAS** d'y participer.

Nom de l'enfant ________________________ Date de naissance _______________

Signature du parent/tuteur ou tutrice ___________________ Date _____________

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INFORMATION SUPPLÉMENTAIRE

Puisque cette étude se fait sur une période de huit jours, nous recherchons des enfants qui participent aux camps d'été des Gee-Gee pour une période de deux semaines consécutives. Votre enfant ne doit pas nécessairement être inscrit au camp aquatique pour les deux semaines, puisqu'il est possible de continuer avec la session de natation pendant la deuxième semaine, même si votre enfant participe à un autre camp du programme de l'Université. Veuillez noter que toutes les sessions se tiendront de 8 h30 à 9h, afin de minimiser les contretemps des activités des camps. En plus, si vous accordez la permission, vous continuerez de reconduire votre enfant vers son moniteur de camp et notre instructeur de natation ira lui-même le chercher le matin à cet endroit. Si vous êtes intéressé dans cette étude, veuillez indiquer ci-dessous les dates et les camps où votre enfant est inscrit :

Nom de l'enfant	Semaine du	Camp

Appendix J

Source Tables from SPSS Output for Article 1

Dependent Variable: Motivation

Acquisition Phase

3 (Group) X 3 (Session) ANOVA with repeated measures on the last factor.

Tests of Within-Subjects Effects

Source	SS	df	MS	MSE	F
session	3.7	2	2.4	6.5	.37
session*group	25.9	4	8.5		1.3

Tests of Between-Subjects Effects

Source	SS	df	MS	MSE	F
Group	127.8	2	63.9	31.6	2.02

Retention Phase

3 (Group) one-way ANOVA

Tests of Between-Subjects Effects

Source	SS	df	MS	MSE	F
Group	420.4	2	210.2	14.3	14.7

Dependent Variable: Self-Efficacy

Acquisition Phase

3 (Group) X 3 (Session) ANOVA with repeated measures on the last factor.

Source	SS	df	MS	MSE	F
session	39.9	2	26.5	2.7	9.7
session*group	6.2	4	2.04		.75

Tests of Between-Subjects Effects

Source	SS	df	MS	MSE	F
Group	1.8	2	.92	4.3	.2

Retention Phase

3 (Group) one-way ANOVA

Source	SS	df	MS	MSE	F
Group	12.9	2	6.5	1.7	3.8

Dependent Variable: Self-Satisfaction

Acquisition Phase

3 (Group) X 3 (Session) ANOVA with repeated measures on the last factor.

Tests of Within-Subjects Effects

Source	SS	df	MS	MSE	F
session	2.1	2	1.2	2.5	.49
session*group	4.8	4	1.2		.56

Tests of Between-Subjects Effects

Source	SS	df	MS	MSE	F
Group	14.1	2	7.05	2.7	2.6

Retention Phase

3 (Group) one-way ANOVA

Source	SS	df	MS	MSE	F
Group	19.6	2	9.8	1.1	8.9

Dependent Variable: Physical Performance

Acquisition Phase

3 (Group) X 3 (Session) ANOVA with repeated measures on the last factor.

Tests of Within-Subjects Effects

Source	SS	df	MS	MSE	F
session	1477.2	2	786.9	15.8	49.7
session*group	73.3	4	19.5		1.2

Tests of Between-Subjects Effects

Source	SS	df	MS	MSE	F
Group	1089.9	2	544.9	124.8	4.4

Retention Phase

3 (Group) one-way ANOVA

Tests of Between-Subject Effects

Source	SS	df	MS	MSE	F
Group	1124.2	2	562.1	41.6	313.6

Appendix K

Source Tables from SPSS Output for Article 2

3 (Group) X 3 (Theme) X 6 (Session) ANOVA with repeated measures on the last two factors.

Tests of Within-Subjects Effects

Source	SS	df	MS	MSE	F
theme	59762.7	2	48827.7	4650.2	10.5
theme*group	1640.4	2	1340.3		.29
session	2776.1	5	555.2	306.9	2.7
session*group	606.6	5	181.9		.59
theme*session	14961.2	10	2587.1	1079.9	2.4
Theme*session* group	5172.9	10	894.5		.82

Tests of Between-Subjects Effects

Source	SS	df	MS	MSE	F
Group	25.1	1	25.1	775.3	.03

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