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The Cognitive and Motivational Effects of Imagery Training

From Different Visual Perspectives

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Thesis

Submitted to the School of Graduate Studies in partial fulfillment of

the Master of Arts Degree in Human Kinetics

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Abstract

The primary purpose of this study was to examine Hardy's (1997) hypothesis that external visual imagery is the most beneficial imagery perspective for tasks that focus on form and body shape. A secondary purpose was to test whether a short-term imagery training program would result in improvements in imagery ability. Eighteen synchronized figure skaters participated in a five week imagery training program that focused on imaging the form and body position of skating skills in practice and competitive situations. Analysis of the results provided support for Hardy's hypothesis because skaters who adopted an external imagery perspective benefited the most from the imagery training program. This was demonstrated by a significant increase in the use of the cognitive functions of imagery as measured by the Sport Imagery Questionnaire. In comparison, skaters who adopted an internal perspective made no significant improvements. Significant improvements were made on both general imagery ability and a skating specific scale. The results are further discussed in terms of an athlete's preference for a particular imagery perspective, as well as the implications for sport psychology consultants.

Chapter 1

Revised Literature Review

Revised Literature Review

Introduction

Mental imagery has been defined as using all the senses to recreate or create an experience in the mind (Vealey & Walter, 1993). It is a technique commonly used by elite athletes to enhance their performance, and boost self-confidence (Mumford & Hall, 1985; Moritz, Hall, Martin, & Vadcoz, 1996). Athletes also use imagery for motivation, by seeing themselves being successful at the sport they participate in (Moritz, Hall, Martin & Vadcoz, 1996; Paivio, 1985; Salmon, Hall & Haslam, 1994; Vadcoz, Hall & Moritz, 1997). Imagery has also been used for skill correction, with the skill being mentally “slowed down” to examine technique and correct problems (Hinshaw, 1991-92). Finally, research has shown that imagery combined with physical practice is better than physical practice alone when learning a new skill (Feltz & Landers, 1983; Hinshaw, 1991-92).

Why is it that mental imagery has been useful in all of these different situations? One factor related to this question is the idea that imagery has at least five different functions (Moritz, Hall, Martin & Vadcoz, 1996). Further, it is likely that each of these functions are contributing differentially in the various situations mentioned. An additional factor is that athletes can adopt one of two different perspectives when imaging, external and internal, and either perspective can be used in any given situation. But, which one of these perspectives is optimal? As well, to date, numerous mediating variables have been identified as being related to the effectiveness of imagery use, such as imagery ability (Vadcoz, Hall & Moritz, 1997), task demands (White & Hardy, 1995), and the individual’s preference for a particular perspective (Hall, 1997). The question of

interest here is, the influence of imagery perspective on the five functions of imagery. Other variables such as task demands, the use of kinesthetic sensations, and user preference will be controlled.

Over the last twenty years, there has been a great deal of research conducted on the variable of imagery perspective. In the next sections, research is reviewed on : (1) the definition of imagery perspective; (2) internal imagery as being the “optimal perspective”; (3) the variable of task demands; and (4) the individuals preference for a particular imagery perspective.

Imagery Perspective

Mahoney and Avener (1977) categorized two different perspectives that an athlete can take when performing mental imagery; external and internal. They defined an external imagery perspective as the person taking the position of an observer, as if watching a film or video of a past performance. An internal imagery perspective was defined as when the athlete views the images as being inside of his/her body and experiencing all those sensations which might be expected in the actual situation.

In their exploratory study on elite gymnasts, Mahoney and Avener (1977) reported that gymnasts who qualified for the Olympic team reported using a higher frequency of internal images as compared to external images than did non-qualifying gymnasts. Rotella, Gansneder, Ojala and Billing (1980) attempted to replicate this study with skiers, and their results indicated that an internal perspective was also a characteristic of the more successful skiers. Similarly, Orlick and Partington (1988) reported that Canadian athletes competing at the 1984 Olympic Games “had developed

an inside view, as if the athlete was actually doing the skill ..." (p. 113). Other studies have also indicated that an internal perspective is more effective in improving performance than that of an external perspective (Barr & Hall, 1992; Epstein, 1980; Mahoney, Gabriel & Perkins, 1987).

One factor that has been argued to contribute to the success of internal imagery is that it is "closer to real-life" (Epstein, 1980; Harris & Robinson, 1986; Mahoney & Avenier, 1977; Mumford & Hall, 1985; Orlick, 1990). Ideally, the athlete should be attempting to recreate all the sensations associated with the skill while doing imagery rehearsal (Vealey & Walter 1993), and thus, this would include the kinesthetic sensations as well. Moreover, it is the kinesthetic sensations that are thought to be generated best when using an internal perspective (Barr & Hall, 1992; Epstein, 1980; Hall, Rodgers & Barr, 1990; Mahoney & Avenier, 1977). As a result, the kinesthetic sensations may be the determining factor in internal imagery being the optimal perspective.

This argument, that internal imagery is better than external as a result of the benefits being associated to kinesthetic sensations, has been supported in different ways. A number of authors, for example, have found that the most successful imagers reported using kinesthetic sensations (Orlick & Partington, 1988; Hall & Erffmeyer, 1983; Nideffer, 1976; White et al., 1979). As well, in a recent study, Barr and Hall (1992) administered the Imagery Use Questionnaire (IUQ) to 348 rowers. The results showed that the rowers used more internal than external imagery, and that incorporating "feel" into their images was an important part of their imagery sessions.

Along with this anecdotal evidence, empirical evidence has also been used to reinforce the notion that internal imagery is better because of the kinesthetic sensations driven by it. The main source of evidence comes from the studies that show that persons using an internal perspective will generate a physiological response similar to what would occur when actually performing the skill (Suinn, 1993). Such results have led to the development of the psychoneuromuscular theory of imagery (Suinn, 1993). Researchers subscribing to this theory, believe that imagery benefits performance, because the same nerves stimulated during physical practice are stimulated during imagery, but at a smaller magnitude. These nervous connections made during imagery are believed to improve “muscle memory”, since the muscles are “learning” to perform the skills pictured in the mind (Hinshaw, 1991-92). This, in turn, is thought to assist with the fine tuning of the skill (Magill, 1993). Indeed, research has found that these nervous connections are best made when internal imagery is used as opposed to external imagery (Bird, 1982; Hale, 1982). For example, Bird’s (1984) study using EMG quantification of mental rehearsal showed that athletes who imaged internally, had both electromyographic (EMG) and temporal congruence between actual and imagined skills as compared to athletes who imaged from an external perspective. Harris and Robinson (1986), using a more rigorous methodology, also showed that internal imagery resulted in more EMG activity than external imagery.

External imagery has also been argued to be limited because it involves the athlete taking a critical, and self-evaluative role which may lead to increased self-consciousness, and/or the athlete being distracted from other more important aspects of imaging (Epstein,

1980; Smith, 1987). This perspective also requires the person to be somewhat removed from and not personally involved in the “action” of the image (Hinshaw, 1991-92). As well, Schick (1970) reported that external imagery was most widely associated with individuals who lacked prior experience or instruction in imagery. These individuals varied greatly in what they were actually imaging, and some were forming images of people other than themselves.

In sum, the internal imagery perspective has been advocated as the best perspective for athletes to use, with the external perspective being argued to be limited and leaving the performer somewhat removed from the action of the skill. Researchers have attributed this benefit to the occurrence of kinesthetic sensations being best experienced through internal imagery (Barr & Hall, 1992; Epstein, 1980; Mahoney & Avenier, 1977; Hall, Rodgers & Barr, 1990). Recent research, however, has shown that athletes are capable of experiencing kinesthetic sensations from both an internal or external imagery perspective (Callow & Hardy, 1997; Glisky, Williams & Kihlstrom, 1996; Gordon, Weinberg & Jackson, 1994; White & Hardy, 1995). For example, Glisky et al. (1996) reported that there were no differences on the number of kinesthetic sensations experienced by internal or external imagery groups in their study examining the performance of a cognitive/visual task (a stabliometer) and a motor/kinesthetic task (an angles estimation task). White and Hardy (1995) also reported that subjects using an external perspective experienced kinesthetic sensations with the same frequency as those using an internal perspective.

Given these new findings, the question arises as to whether it is the internal imagery perspective that is superior or the kinesthetic sensations that were linked to the adopted perspective. In order to address this issue of which perspective is better, it would be important to keep the kinesthetic component constant between different training groups who have adopted the two perspectives. If the kinesthetic component is held constant, we might be able to better address the issue of whether internal imagery should be the recommended perspective. This question, however, is not so simple to address as it appears that different factors influence the level of benefits derived from imagery. Two of these factors, task demands and the users preference for a particular imagery perspective will be introduced in the next section.

Task Demands and Perspective Preference

Researchers have suggested that imagery perspective may depend on the specific demands of the task (Gordon, Weinberg & Jackson, 1994), and that these demands should be assessed so that the correct perspective can be used by athletes (Callow & Hardy, 1997; Glisky, Williams & Kihlstrom, 1996; Hardy, 1997; White & Hardy, 1995). Hardy and colleagues developed an hypothesis concerning the relationship between imagery perspective and task demands. Briefly, they proposed that the external perspective is best suited for skills where aesthetic qualities are important, whereas skills where one needs to respond to external information or are simple and well-learned, the internal perspective would be better (Hardy, 1997).

This hypothesis was formed based on the findings in observational learning studies. Observational learning is an often used technique whereby a model provides a

demonstration of a motor skill to be learned (Magill, 1996). Numerous studies have shown that the learning of motor skills is facilitated through this observation process (for a review, see McCullagh, 1993). White and Hardy (1995) argued that external imagery can be considered to operate as a visual model, since it is seen from a third-person perspective. As an illustration, they stated “A perfectly clear and vivid external image will consist of exactly the same perceptual features as would be seen when watching a model, despite being internally generated” (p. 171). Furthermore, external imagery was said to provide the learner with the opportunity to practice key visual aspects of the internally generated model, such as form and body shape.

For sports such as figure skating, gymnastics and diving , these are definitely important performance features. The sport of interest here is synchronized skating wherein a team of skaters execute maneuvers in synchronization (much like that seen in a chorus line). In competition, the team is evaluated by a panel of judges who attend to the unison of the form and lines presented by the skaters. For example, 4-spoke pinwheel, is made up of two lines that revolve around their point of intersection. The objective of the team is to revolve in a circular fashion without losing the straight line formation, while at the same time keeping their head and arms in as exact a position as possible such that they all look identical.

To return to the hypothesis generated by Hardy (1997), when considering a four-spoke pinwheel skill in synchronized skating, wherein the precise presentation of an individual relative to the group as a whole is important, the external visual imagery perspective would be argued to allow the skaters to image the desired position. That is,

this perspective will allow her to view the formation of the group and herself in relation to the group. Simultaneously, the kinesthetic sensations associated with the necessary movements could still be incorporated and thus the skater would be able to see the desired shape and feel the associated sensory experiences. Imaging such a skill from an internal visual imagery, however, would not allow the skater to see herself in relation to the other team members and the desired formation of the team, but rather would provide her with information on the aspects that she can visualize from where her head is oriented at any particular time. Thus, for synchronized skating skills where form and synchronized of body shape are important, an external imagery perspective may be the most beneficial imagery perspective as opposed to the internal perspective. This prediction is therefore in line with Hardy's hypothesis (1997), and is tested here.

On the other hand, an internal imagery perspective may be appropriate for other types of tasks. For example, since internal imagery allows the performer to see the view that would be seen during the actual performance, it might be appropriate for tasks that require modification of motor responses according to changes in the visual field as the performer moves through it (White & Hardy, 1995). These tasks have commonly been referred to as open skills. Sport examples of open skills include, tennis and ski slalom. Internal imagery may also benefit performers for tasks that are relatively simple, well-learned and are not required to have a particular shape (Hardy, 1997).

White and Hardy (1995) tested whether the demands of the tasks and benefits related to the imagery perspective were linked by examining differences in the learning and performance of two different types of tasks. One task was a laboratory-based simulation

of a canoe slalom, where the participants were required to respond to external information, and the other task was a gymnastic type routine. In general, the hypothesis was supported. For the canoe slalom task, internal visual imagers made significantly less mistakes as hypothesized, but the external visual imagers were significantly faster across all trials. This motivational effect was explained as the external visual imagers comparing themselves with their own image generated from an external perspective, which may have enhanced their competitive drives. This led the external imagers to strive for faster times at the cost of more errors. For the gymnastic task, the participants using external visual imagery were found to be superior to the internal perspective group. Other studies have since shown external imagery benefiting performance more so than internal imagery and the tasks used have had the performance quality of very precise body positions, such as a Callow and Hardy's (1997) research using a gymnastic routine as well as Hardy and Evans' (in preparation, as cited in Hardy, 1997) rock climbing task.

These three studies have indicated that in some circumstances, external imagery was the optimal perspective. However, the tasks selected were quite polarized in terms of the task demands allowing one perspective to emerge as being superior for enhancing performance. But, it is possible that one task can contain both types of demands. This may explain why studies that use sports in general, rather than specific skills of the sport, find no difference between imagery groups (Mumford & Hall, 1985; Highlen & Bennett, 1979; Meyers, Cooke, Cullen, and Liles, 1979). For example, in a study by Gordon, Weinberg & Jackson (1994) comparing the effects of training individuals to use either an internal or external perspective prior to performing a cricket task, they were unable to

show a difference between imagery groups. They did indicate, however, that 50% of the participants reported switching between the two perspectives. Using Hardy's (1997) hypothesis, the performers may have been using an internal perspective to see the pitcher and the ball approaching the bat, a component of the skill that requires focus on externally paced visual cues, and then have switched to an external perspective to see the form of the swing.

Although, Hardy (1997) suggested that "if the task places a strong emphasis upon form or body shape, then performers might be encouraged to try and combine external visual imagery with kinesthetic imagery" (p. 290), this suggestion does not take into account the performer's preference for a particular perspective. Research has shown that when participants are assigned to a particular perspective, they tend to switch to the perspective they feel most comfortable with (Gordon, Weinberg & Jackson, 1994). Moreover, Hall (1997) suggested that "to have an athlete change their imagery perspective, even if the nature of the task seems to warrant it, might actually prove to be detrimental" (p. 311). He concluded that athletes should be encouraged to practice both internal and external perspectives, but should use the perspective they feel most comfortable with. Research by Ungerleider and Golding (1991) reported that 34.3% of Olympic athletes used both perspectives equally, however, the majority of the athletes did have a definite preference for using either an internal or external imagery perspective. For this reason, this research study will take into account the individuals preference for a particular imagery perspective. More specifically, the participants will be encouraged to image from the perspective they feel most comfortable using.

The implications for this research in an applied setting is that if an athlete was capable of using both perspectives, then the athlete could select the perspective best suited to meet the demands of the task. In doing so, the person would be able to derive the optimal benefits from using imagery. However, if the athlete does have a definite preference, the suggestion has been that it may be better to encourage the athlete to use their preferred perspective, even if it is not the one recommended according to the task demands (Hall, 1997). In such a situation, would imagery still lead to benefits in performance? This question can be best addressed by considering the functions of imagery use, which are expanded upon in the next section.

Functions of Imagery

Paivio (1985) proposed a general analytical framework in order to explain the effects of imagery on motor performance (see figure 1). This framework identified imagery has having both cognitive and motivational functions, with each operating at a general or specific level. The specific function of motivation (MS) would be to image goals and the activities necessary for achieving these goal. For example, a figure skater may use imagery to see herself achieving a specific goal, such as winning a medal. The motivational general (MG) function relates to the degree of physiological arousal and emotions that might accompany the imagined success or failure of achieving a given goals. To continue with the above example, the figure skater may use imagery to see herself handling the stress and excitement of a competition by remaining calm and focused. The cognitive function of imagery would include imaging the specific skills of the sport (CS) as well as general behavioral strategies (CG). In line with the figure skating example, she

may use imagery to see herself performing a particular jump perfectly (CS), as well as to plan a strategy to use if she falls on that jump in competition (CG).

Figure 1. Paivio's model. Adapted from Paivio (1985)

FUNCTIONS OF IMAGERY

	Motivation	Cognition
General	Arousal and Affect	Strategies
Specific	Goal-oriented Responses	Skills

The cognitive and motivational functions are thought to be orthogonal in nature, such that an athlete can use either function alone or in combination with each other (Hall, Mack, Paivio & Hausenblas, 1998; Vadcoz, Hall & Martin, 1997). For example, Vadcoz, Hall and Martin (1997) suggested that an athlete can image a specific skill (CS) without thinking about it's behavioral goal (MS), or image the atmosphere of a competition (MG-A) without seeing any specific skills (CS) or behavioral strategies (CG). The athlete is also said to be capable of imaging both cognitive and motivational functions at once.

Most of the imagery research reviewed thus far, has been examining the use of imagery solely for it's cognitive purposes. This would include the research examining which imagery perspective an athlete adopts (Epstein, 1980; Harris & Robinson, 1986; Mahoney & Avener, 1977; Mumford & Hall, 1985). Additionally, research has attempted to understand how athletes actually use imagery in training and competition. For example, Hall, Rodgers and Barr (1990) reported that general trends of imagery use

existed for athletes across different sports. They showed that athletes across competitive levels use imagery extensively, but tended to use it more in conjunction with competition than with training, suggesting that athletes may use imagery more for motivational purposes (Barr & Hall, 1992; Hall, Rodgers & Barr, 1990; Rodgers, Hall & Buckolz, 1991). This question, however, was not specifically addressed until Salmon, Hall & Haslam (1994) modified the questionnaire used in previous studies in order to include questions that would tap into all four cells of Paivio's model. They found that soccer players used both functions of imagery, but tended to use imagery more for motivation than cognitive purposes.

In order to replicate these findings across different sports, the Sport Imagery Questionnaire (SIQ; Hall, Mack, Paivio & Hausenblas, 1998) was developed based on an adapted version of Paivio's (1985) model. This newer model consisted of five sub-scales to measure the functions of imagery, with the motivation general function being divided into motivation general-arousal (MG-A; e.g., imaging the arousal, stress, and anxiety that may accompany performance) and motivation general-mastery (MG-M; e.g., imaging staying focused and working through problems) in order to differentiate between using imagery to adjust arousal levels and for using imagery to stay focused (Moritz, Hall, Martin & Vadcoz, 1997). Consistent with the findings in the Salmon et al. (1994) study, research with the SIQ has shown that athletes across different sports use both functions, but tend to use imagery more for motivation, especially just prior to competing (Martens, Zizzi, Mack & Hall, 1997; Moritz, Hall, Martin & Vadcoz, 1996; Munroe, Hall,

Weinberg & Giacobbi, 1997; Vadcoz, Hall & Moritz, 1997). Specifically, athletes use MG-Mastery imagery the most, followed by CS, MS, MG-Arousal, and then CG.

Furthermore, athletes seem to be using motivational imagery to help control other variables important to performing successfully such as competitive state anxiety and self-confidence (Moritz, Hall, Martin & Vadcoz, 1996; Vadcoz, Hall & Moritz, 1997).

Moritz et al (1996) examined the imagery content of self-confident athletes, and showed that imagery rehearsal of specific sport skills (CS) was not as important for self-confident athletes as the imagery of sport-related mastery experiences (MG-M) and arousal (MG-A). Vadcoz et al. (1997) also showed that athletes who employed more MG-Mastery imagery had higher levels of self-confidence. That is, the athletes who imaged themselves to be in control of difficult situations and/or imaged themselves being mentally tough had higher self-confidence (Vadcoz, Hall & Moritz, 1997). This study also showed that MG-Arousal was a significant predictor of cognitive anxiety, such that athletes who employed more MG-A had higher levels of cognitive anxiety. Because anxiety can be both facilitative or debilitating, Vadcoz et al. (1997) suggested that MG-A would only be useful for athletes who had trouble getting motivated for a competition, but should not be used by athletes who become more nervous with increased levels of cognitive anxiety. Further evidence of the motivational role of imagery is provided by experimental research that found that athletes instructed to image a successful performance voluntarily practiced harder and longer than a control group (Hall, Toews & Rodgers, 1990b). Martin and Hall (1995) also demonstrated that subjects using imagery were more motivated to practice compared to a control group.

Research with the SIQ has also suggested that there is a positive relationship between imagery use and performance (Hall, Mack, Paivio and Hausenblas, 1998). The exact nature of the relationship seems to vary with both skill level and sport. For example, Hall et al. (1998) reported that the motivational functions of imagery were more likely to predict performance for more elite athletes of a sample population. Whereas, the cognitive functions of imagery were more likely to predict performance for athletes competing at lower competitive levels. This would be consistent with Rushall and Lippman's (1998) contention that different forms of imagery are used at different stages of an athlete's development. For example, the use of imagery for a cognitive function might be used at the lower levels of competition, when the athlete is continuing to develop and refine skills. However, for an athlete who has achieved fully-automated skills, it would be unnecessary, and even detrimental, to their performance to direct their attention to the specific aspects of the skill (Rushall & Lippman, 1998). Therefore, once an athlete has developed the necessary skills, imagery would be used more for motivation and setting arousal levels. Thus, it would appear that there is a specific sequence for the functions of imagery to be used during an athlete's development. In reality, however, athletes probably would go back and forth between the different functions, as they are constantly developing new skills, competing with these skills, and then further refining them for future competitions.

The question then arises as to whether athletes can increase their use of these functions through imagery training, as well as to what extent both the cognitive and motivational functions are impacted with such training. Research has indicated that figure

skaters were able to change their patterns of imagery use within a sixteen week imagery training program (Rogers, Hall & Buckolz, 1991) as measured by the Imagery Use Questionnaire (IUQ; Hall, Rodgers & Barr, 1990). Although these findings do not speak directly to the functions of imagery, it is possible that these functions of imagery will change following a short term imagery training program. As well, Rodgers et. reported improvements in the skater's imagery ability improved as measured by a test-retest of the Movement Imagery Questionnaire (MIQ; Hall & Pongrac, 1983). Specifically, the skaters significantly improved their visual ability scores and demonstrated a trend for improving kinesthetic ability. This point is of particular interest because it demonstrates how athletes can improve their imagery ability as a result of a fairly long training program. In the proposed research, there is a five week training program. Thus, it is also of side interest to determine whether a shorter term training will be of sufficient length to demonstrate improvements in imagery ability.

To return to the main focus of this study, the SIQ is a relatively new instrument, and the research conducted thus far has probably generated more questions than it has answered. For this reason it needs to be studied further. For example, the effect of imagery perspective on the functions of imagery has not yet been determined. It would be important to examine this question considering that recent studies have consistently reported that athletes use imagery more for motivation than cognitive purposes. Previous research on task demands and imagery perspective, however, have been tapping into the cognitive function of imagery and have not taken into account the use of imagery for motivational purposes.

Because research by Rodgers et al. (1991) has suggested that it is possible that these functions of imagery will change following an imagery training program, we tested this hypothesis by implementing a five week imagery training program to a group of synchronized figure skaters. The imagery training sessions focused on posture, facial expression, and placement of the arms and legs in synchronized figure skating skills. The skaters were also given both practice and competitive contexts within the ten sessions, generating the potential for both cognitive and motivational functions of imagery to be activated. Considering these features of the training session, the manner in which the functions of imagery may change following the short term imagery training program can be more refined.

Recall that Hardy (1997) suggested that a skill with an emphasis on form and body shape, may benefit more from an external perspective. Certainly, the focus of the training sessions are on qualities of this nature and thus skaters that adopt the external imagery perspective were expected to benefit more from the training than the internal perspective. This was expected to be reflected in the differences between the pretest and posttest scores of the SIQ. Specifically, both external and internal imagers were expected to show benefits for the motivational functions of imagery, however the external imagers were expected to yield more benefits for the cognitive functions of imagery than the internal imagers. The rationale for this was that the external perspective was thought to be a better source of information than that obtained from the internal perspective concerning the qualities of the skill that were the focus in the imagery sessions. Thus, while this

would benefit the cognitive specific functions, it may not affect differences that would emerge at the motivational level.

Rationale for Selecting Population of Study

In order to examine the effect of imagery perspective on the functions of imagery, a synchronized figure skating population will be used. Figure skating has been considered to be an appropriate medium for studying the effects of a mental imagery training program, because it is a closed sport, and outside factors can be more easily controlled (Rodgers, Hall & Buckolz, 1991). Although researchers have studied the effects of imagery training on figure skating performance (Rodgers, Hall & Buckolz, 1991; Hall & Rodgers, 1989; Mumford & Hall, 1985), none have kept the amount of kinesthetic imagery constant among training groups.

For example, Mumford & Hall (1985) attempted to examine the influence of different imagery perspectives on the performance of a figure. They employed four different conditions; a control condition, an external imagery perspective, an internal visual imagery perspective, and an internal visual imagery perspective combined with kinesthetic sensations. Contrary to their hypothesis, no support was shown for internal kinesthetic imagery being the superior training technique, but a trend appeared for the internal kinesthetic group to display the most amount of improvement. However, the researchers never asked the external imagery group to what extent they were using kinesthetic images, which may have contributed to their performance.

A second reason for selecting a synchronized figure skating population is due to the aesthetic nature of the sport. No research to date has examined the influences of

different imagery perspectives on a figure skating skill that emphasizes form and body shape. Such a skill has been chosen in order to extend the research conducted with gymnastic and rock climbing populations to examine the effects of imagery perspective on the functions of imagery.

Purpose

The primary purpose of this study is to test Hardy's hypothesis that external imagery is the most beneficial imagery perspective for synchronized figure skating skills that place an emphasis on form and body shape. Factors that will be controlled include keeping the amount of kinesthetic imagery constant between training groups and assigning skaters to image from their preferred visual imagery perspective. In doing so, it is thought that any differences between groups will be related to the imagery training, and not these extraneous variables. In order to test Hardy's hypothesis, this study will examine the effects of training imagery perspectives on the functions of imagery as measured by a pre- and post-test of the SIQ. It is predicted that skaters using an external imagery perspective will show the greatest increase in the use of cognitive specific images as compared to an internal imagery training group or a control group. Both training groups are predicted to increase their use of motivational images as compared to a control group. By doing so, this will prove Hardy's hypothesis, because the external group will be benefiting on both the cognitive and motivational levels, whereas the internal group benefiting on a motivational level.

A secondary purpose of this study was motivated by previous research by Rodgers et al. (1991) that showed figure skaters were able to improve imagery ability

with a 16-week imagery training program. To date, there has been very little research examining the length of imagery training necessary to bring about improvements in imagery ability nor how these changes might be manifested (i.e., changes in visual versus kinesthetic imagery). Because the present study used the same measure of imagery ability, the opportunity arose to test whether a short-term training program would generate improvements in imagery ability.

Chapter 2

Presentation of the Article

Presentation of the Article

In the next section, an article is presented in APA style. My intent is to submit this article entitled “The Cognitive and Motivational Effects of Imagery Training From Different Visual Perspectives” to the Journal of Sport Psychology.

Running Head: TRAINING VISUAL IMAGERY PERSPECTIVES

The Cognitive and Motivational Effects of Imagery Training

From Different Visual Perspectives

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Abstract

Based on previous research by Hardy (1997), the purpose of this study was to examine whether external visual imagery, combined with kinesthetic sensations, would be the most beneficial imagery perspective for synchronized skating skills that focused on form and body shape. It was hypothesized that skaters who had adopted an external imagery perspective would show the greatest increases in their use of cognitive images as compared to skaters using an internal perspective. To this end, 16 novice synchronized skaters participated in a five week imagery training program that focused on the form and body shape of skating skills in practice and competitive situations. The Sport Imagery Questionnaire was used to assess changes in the skaters use of cognitive and motivational images as a result of the training program. The results provided support for the hypothesis because only the skaters using an external imagery perspective significantly increased their use of cognitive specific and cognitive general images as compared to skaters using an internal imagery perspective who made no significant improvements on any of the SIQ's sub-scales.

The Cognitive and Motivational Effects of Imagery Training From Different Visual Perspectives

Mahoney and Avener (1977) defined two different perspectives that an athlete can take when performing mental imagery; an external or internal perspective. They defined an external imagery perspective as the person taking the position of an observer, as if watching a film or video of a past performance. An internal imagery perspective was defined as the athlete viewing the images as though he/she was inside his/her body and experiencing all those sensations which might be expected in the actual situation. In their exploratory study on elite gymnasts, Mahoney and Avener (1977) reported that gymnasts who qualified for the Olympic team reported using a higher frequency of internal images as compared to external images than did non-qualifying gymnasts. Other researchers have also indicated that internal imagery is characteristic of successful athletes (Epstein, 1980; Harris & Robinson, 1986; Mumford & Hall, 1985; Orlick, 1990), and in turn, have advocated internal imagery as the best perspective for athletes to use. The external perspective, on the other hand, has been argued to be limited and leaving the performer somewhat removed from the action of the skill (Epstein, 1980).

Research concerning the optimal imagery perspective, however, has a number of problems. First, a common assumption has been that kinesthetic sensations could only be incorporated into an internal perspective and that the external perspective was only of a visual nature (Epstein, 1980; Hale, 1982; Hinshaw, 1991; 1992). As well, many have failed to consider that the benefits received from imaging from a particular imagery perspective is specific to the skill being imaged (Barr & Hall, 1992; Epstein, 1980;

Mahoney & Avenier, 1977). Finally, the experimental design used has often not included proper control measures concerning the actual perspective adopted and whether participants shifted between the two imagery perspectives (Epstein, 1980; Harris & Robinson, 1986, White & Hardy, 1995). The following sections address these three problems in a more detailed fashion and lead to the purpose of our study, which is to identify the best imagery perspective for skills characterized by defined body positions and aesthetic qualities in synchronized figure skating.

Previous researchers have often advocated internal imagery as the best perspective to use because it was believed that kinesthetic sensations were best experienced through an internal perspective (Barr & Hall, 1992; Epstein, 1980; Hall, Rodgers & Barr, 1990; Mahoney & Avenier; 1977). Recent research, however, has shown that athletes are capable of experiencing kinesthetic sensations from both an internal or external imagery perspective (Callow & Hardy, 1997; Glisky, Williams & Kihlstrom, 1996; Gordon, Weinberg & Jackson, 1994; White & Hardy, 1995). For example, Glisky et al. (1996) reported that there were no differences on the number of kinesthetic sensations experienced by internal or external imagery groups in a study that examined the performance of two different types of tasks; a motor/kinesthetic task (stabilometer) and a cognitive/visual task (angles estimation task). White and Hardy (1995), using a gymnastic type routine, also reported to having participants who experienced kinesthetic sensations from an external perspective.

Thus, it becomes important to examine the kinesthetic sensations within each of the two perspectives being studied, and to confirm whether these contributions are

similar. If there is a difference in the amount of kinesthetic contributions in one perspective as compared to the other, we could not attribute any benefits to the actual perspective adopted. Rather, the controlling factor may in fact be the amount of kinesthetic sensations generated by the image. For this reason, this study included a measure to ascertain the level of perceived kinesthetic sensations on the part of the participants in the two different imagery perspective groups. Moreover, we actively encouraged the participants to include kinesthetic sensations regardless of the actual perspective that they adopted.

Recently, researchers have argued that the effectiveness of a particular visual imagery perspective may be dependent upon the demands of the task being imaged (Glisky, Williams & Kihlstrom, 1996; Hardy, 1997; White & Hardy, 1995). More specifically, Hardy (1997) hypothesized that skills emphasizing aesthetic qualities, such as form and body shape, would benefit most from an external perspective. Alternatively, an internal perspective would be beneficial for those skills which are simple, well-learned or where one needs to respond to external information.

This hypothesis was formed based on the findings in observational learning studies. Observational learning is an often used technique whereby a model provides a demonstration of a motor skill to be learned (Magill, 1996). Numerous studies have shown that the learning of motor skills is facilitated through this observation process (for a review, see McCullagh, 1993). White and Hardy (1995) argued that external imagery can be considered to operate as a visual model, since it is seen from a third-person perspective. As an illustration, they stated "A perfectly clear and vivid external image

will consist of exactly the same perceptual features as would be seen when watching a model, despite being internally generated” (p. 171). Furthermore, external imagery was said to provide the learner with the opportunity to practice key visual aspects of the internally generated model, such as form and body shape.

To address this issue, White and Hardy (1995) tested whether the demands of the tasks and benefits related to the imagery perspective were linked by examining differences in the learning and performance of two different types of tasks. One task was a laboratory-based simulation of a canoe slalom, where the participants were required to respond to external information. Given that these task demands required responses to externally driven stimuli, an internal perspective was expected to be better. The other task was a gymnastic type routine, which required the participants to perform precise body positions, therefore for this task, an external perspective was expected to be better.

The participants were assigned to experimental groups according to their preference for a particular perspective, however, participants who were capable of imaging from both perspective were randomly assigned to either experimental group. No control measures were used throughout the training program to assess to what extent the participants maintained their imagery perspective, however, post-experiment interviews were conducted to ensure that the participants did not switch imagery perspectives, as well as to ask the participants if they had experienced any kinesthetic sensations during the imagery.

In general, the hypothesis was supported. For the canoe slalom task, internal visual imagers made significantly less mistakes as hypothesized, but the external visual

imagers were significantly faster across all trials. This motivational effect was explained as the external visual imagers comparing themselves with their own image generated from an external perspective, which may have enhanced their competitive drives. This may have led the external imagers to strive for faster times at the cost of more errors. For the gymnastic task, the participants using external visual imagery were found to be superior to the internal perspective group. Other studies have since shown that external imagery is more beneficial to performance than internal imagery for that require precise body positions, such as Callow and Hardy's (1997) research using a gymnastic routine as well as Hardy and Evan's (in preparation, as cited in Hardy, 1997) rock climbing task.

Aside from gymnastics and rock climbing, other sports have the important performance features of attaining a particular form and body shape. One example is synchronized skating, which is the sport of interest here. In this sport, a team of skaters execute precise skating movements in time with each other (much like that seen in a chorus line). In competition, the team is evaluated by a panel of judges who award technical marks based on the unison of the form and lines presented by the skaters. For example, a four-spoke pinwheel is a skill that is made up of two lines that revolve around their point of intersection. The objective of the team is to revolve in a circular fashion without losing the straight line formation, while at the same time keeping their head and arms in as exact a position as possible such that they all look identical.

To return to the hypothesis generated by Hardy (1997), when considering a four-spoke pinwheel in synchronized skating, wherein the precise presentation of an individual relative to the group as a whole is important, the external visual imagery perspective

would be argued to allow the skaters to image the desired position. That is, this perspective will allow her to view the formation of the group and herself in relation to the group. Simultaneously, the kinesthetic sensations associated with the necessary movements could still be incorporated and thus the skater would be able to see the desired shape and feel the associated sensory experiences. Imaging such a skill from an internal visual imagery, however, would not allow the skater to see herself in relation to the other team members and the desired formation of the team, but rather would provide her with information on the aspects that she can visualize from where her head is oriented at any particular time. Thus, for synchronized skating skills where form and synchronized of body shape are important, an external imagery perspective may be the most beneficial imagery perspective as opposed to the internal perspective. This prediction is therefore in line with Hardy's hypothesis (1997), and was tested in the present study.

Although Hardy and colleagues have tested their hypothesis using performance measures (Callow & Hardy, 1997; White & Hardy, 1995), it has also been suggested that other functions may be related to imagery perspective (Hall, 1997; Hardy 1997). Therefore, the rationale behind the present study is to examine Hardy's hypothesis beyond that of only looking at performance measures. For example, it is possible to examine imagery perspective in terms of potential differential effects on the cognitive and motivational functions of imagery. Paivio (1985) proposed that imagery has both cognitive and motivational functions, with each operating at a general or specific level. The specific function of motivation (MS) would be to image goals and the activities necessary for achieving these goals. For example, a figure skater may use imagery to see

herself achieving a specific goal, such as winning a medal. The motivational general function of imagery is further sub-divided into a mastery (MG-M) function, where the athlete uses imagery to stay focused and to work through problems, and an arousal (MG-A) function, which is used by athletes to image the arousal, stress and anxiety that may accompany performance.

To continue with the previous example, the figure skater may use imagery to see herself handling the stress and anxiety of competition by remaining calm and focused. The cognitive function of imagery would include imaging the specific skills of the sport (CS) as well as general behavioral strategies (CG). Here then, the skater may use imagery to see herself performing a particular jump perfectly, as well as to plan a strategy to use if she falls on that jump in competition.

The cognitive and motivational functions are thought to be orthogonal in nature, such that an athlete can use either function alone or in combination with each other (Hall, Mack, Paivio & Hausenblas, 1998; Vadcoz, Hall & Martin, 1997). For example, Vadcoz et al. (1997) suggested that an athlete can image a specific skill (CS) without thinking about it's behavioral goal (MS), or image the atmosphere of a competition (MG-A) without seeing any specific skills (CS) or behavioral strategies (CG). The athlete can also image both cognitive and motivational functions at once.

To date, the research on imagery perspective has examined the use of imagery solely for it's cognitive purposes (Epstein, 1980; Harris & Robinson, 1986; Mahoney & Avenir, 1977; Mumford & Hall, 1985). That is, these studies have mainly included performance-based measures which reflect the cognitive dimensions of imagery. This

narrow focus is counter to the research that has shown that athletes across different sports use both functions, and moreover, use the MG-Mastery function the most, especially just prior to competing (Martens, Zizzi, Mack & Hall, 1997; Moritz, Hall, Martin & Vadcoz, 1996, Munroe, Hall, Weinberg & Giacobbi, 1997; Vadcoz et al., 1997).

The question then arises as to whether athletes can increase their use of these functions through imagery training, as well as to what extent both the cognitive and motivational functions are impacted by such training. Research has indicated that figure skaters were able to change their patterns of imagery use with a sixteen week imagery training program (Rodgers, Hall & Buckolz, 1991) as measured by the Imagery Use Questionnaire (IUQ; Hall, Rodgers & Barr, 1990). The imagery training program involved two fifteen minute imagery sessions a week for twelve of the sixteen weeks of the study. Each session was individualized to meet the needs of each skater that participated in the study, however, the imagery was limited to technical moves, such as jumps or spins. Although Rodgers et al.'s findings do not speak directly to the functions of imagery, it is possible that similar to the changes in imagery use made as a function of a training program, athletes may be able to increase their use of the different functions of imagery following a similar training program. We tested this hypothesis by implementing a five week imagery training program to a group of synchronized figure skaters.

Along with changes in imagery use, Rodgers et al. also showed that visual imagery ability improved as measured by a test-retest of the Movement Imagery Questionnaire (MIQ; Hall & Pongrac, 1983). They suggested that further research was necessary in order to better understand the length of training needed to bring about improvements in

imagery ability as well as to examine how these changes might be manifested (i.e., changes in visual versus kinesthetic imagery). For this reason, we decided to include the same measure of imagery ability that would initially be used as a screening device, at the end of our training program. In doing so, we would be able to test whether a short-term program could also improve imagery ability.

To return to the main focus of this study, our hypothesis will be further refined via Hardy's (1997) proposals. However, it first needs to be mentioned how our study differs from previous imagery research. Firstly, the skaters were not assigned to a particular imagery perspective but instead adopted their preferred perspective throughout the training program. This is an important point because, as mentioned in the opening of this introduction, a common methodological problem in research concerning imagery perspectives has been the lack of verifying the actual perspective adopted by the athlete. For example, often times researchers assigned athletes to a particular perspective without the knowledge of those athletes' preferred perspectives, the athletes, then, may very well have switched back to their preferred perspective (Epstein, 1980; Harris & Robinson, 1986). Glisky et al. (1996) highlighted this problem and encouraged the use of measures in imagery perspective research to deal with this issue. We have embraced this recommendation by including a measure that allows the athlete to report after each individual session the extent to which one imagery perspective was adopted as well as whether she shifted between the two perspectives.

Secondly, we purposely sought out a sport situation where aesthetic performance qualities would be important in order for it to fall under Hardy's hypothesis. The

training program was designed to focus on the cognitive specific function of imagery however, the script was also be written to promote the use of other functions. More specifically, the imagery training sessions focused on posture, facial expression, and placement of the arms and legs in synchronized figure skating skills. The skaters were also given both practice and competitive contexts within the ten sessions, generating the potential for both cognitive and motivational functions of imagery to be activated. All the skaters listened to the same imagery scripts, but half of the skaters imaged that script from an internal perspective and the other half from an external perspective. Considering these features of the training sessions, the manner in which the functions of imagery may change following the short term imagery training program can be more refined.

Recall that Hardy (1997) suggested that a skill with an emphasis on form and body shape, may benefit more from an external perspective. Certainly, the focus of the training sessions was on qualities of this nature and thus skaters that adopted the external imagery perspective were expected to show increased levels of functions of imagery more so than those that adopted an internal perspective. This was expected to be reflected in the differences between the pretest and posttest scores of the Sport Imagery Questionnaire (SIQ; Hall, Mack, Paivio & Hausenblas, 1998). Specifically, it was anticipated that the skaters who adopted an external perspective would show greater increases in the cognitive functions of imagery because this perspective would better target the requirements of the particular skills being imaged. At the same time however, both external and internal imagers were hypothesized to show similar increases for the motivational functions of imagery. The rationale for this was that the scripts contained

information that provided content for athletes to tap into motivational functions of imagery and that this could be done equally well in either perspective.

In sum, the purpose of this study was to examine whether a five week visual imagery training program for aesthetic components in synchronized skating would affect the functions of imagery used by athletes. Based on Hardy's hypothesis (1997), the predictions were 1) that skaters using an external imagery perspective would show the greatest increase in the use of cognitive specific images as compared to skaters using an internal imagery perspective, and 2) that all skaters would increase their use of motivational images regardless of which imagery perspective was adopted. Such findings would support Hardy's hypothesis, because skaters that had adopted an external perspective would show benefits at both the cognitive and motivational levels whereas the internal group would only show this at the motivational level.

Method

Participants

Eighteen, female, novice level synchronized figure skaters (age range = 10 - 15 years of age; $M = 13.03$ years) were recruited to participate in this study from the Ottawa region. The skaters were encouraged to image from their preferred imagery perspective throughout the imagery training program. One criteria for remaining in the data analysis, however, was that the skater consistently maintained the imagery perspective adopted. Upon examining post session evaluations it was determined that two skaters were not able to maintain the same imagery perspective within and across sessions and for this reason they were not included in the analysis. The end result was

that eight skaters had consistently adopted an external perspective, and the other eight skaters did so for the internal perspective. As well, skaters were screened prior to the start of the study with the Movement Imagery Questionnaire (MIQ; Hall & Pongrac, 1983) to determine that they had similar levels of imagery ability. Dependent T-tests performed on the initial MIQ scores (see table 2, time 1 scores) revealed no significant difference between groups for both visual imagery, $t(7) = 0.88$, $p > 0.05$, and kinesthetic imagery, $t(7) = 0.7$, $p > 0.05$.

Instruments

The Movement Imagery Questionnaire (MIQ; Hall & Pongrac, 1983) was used as a participant screening device because it measures both kinesthetic and visual imagery ability. The MIQ asks the athlete to perform 18 different imagery tasks, and to rate the ease/difficulty with which they are able to do these tasks on a 7-point rating scale, and is scored in such a manner that a low score indicates a higher ability. Atienza, Balaguer and Garcia-Merita (1994) reported that analysis of the MIQ had resulted in an acceptable internal consistency, with alpha coefficients for the total scale being 0.90, 0.89 for the visual sub-scale, and 0.88 for the kinesthetic sub-scale. These coefficients are similar to those reported by Hall, Pongrac & Buckolz (1985).

The Sport Imagery Questionnaire (SIQ; Hall et al., 1998) was used to assess changes in the skaters use of the different functions of imagery as a result of the training program. The SIQ is a 30-item self-report questionnaire that asks athletes to rate on a 7-point scale (1= rarely and 7= often) how often they utilize 5 different types of images: cognitive general (CG), cognitive specific (CS), motivation general-mastery (MG-M),

motivation general-arousal (MG-A), and motivation specific (MS). Moritz et al. (1996) reported that preliminary analysis from three experiments had indicated adequate internal reliability for the five sub-scales, with Alpha coefficients ranging from .57 to .89. Interscale correlations ranged from -.31 to .22, indicating that the SIQ sub-scales were correlated but represented different constructs.

Following each imagery session, the skaters were asked to rate their use of a particular imagery perspective on an eleven-point Likert scale . The skaters were instructed that values of 0-2 would indicate that the skaters had maintained a completely internal perspective or had experienced very minimal switching to an external perspective. In comparison, values of 8-10 would indicate that the skaters had maintained a completely external perspective or had very experienced minimal switching to an internal perspective. In doing so, we would be able to infer whether the skaters had maintained their imagery perspective or had switched. As well, the skaters were asked to rate the ease/difficulty of achieving their visual and kinesthetic images on the same 7-point rating scale used in the MIQ.

Procedure

Prior to the start of the imagery training program, a meeting was held by the primary researcher with both the skaters and parents present. At this time, informed consent was obtained, the skaters received an explanation of the differences between an external and an internal imagery perspective, and they were provided with instructions as to how to complete the MIQ and SIQ. The skaters completed both questionnaires at home, and returned them to the researcher prior to the start of the training program.

The imagery training program consisted of two 15-25 minute sessions a week for five weeks, designed such that it would not demand too much of the skater's time outside their skating schedule, but still be of sufficient length for possible gains to be accomplished. At the start of each session, the researcher reminded the skaters to image from their preferred imagery perspective throughout the entire session. As well, the skaters were instructed in the use of diaphragmatic breathing exercises in order to become more relaxed. Each session consisted of the primary researcher reading an imagery script to the skaters. The scripts were designed in order to encourage the skaters to incorporate both kinesthetic and visual images into their training. For example, the skaters were reminded to image muscular tension (e.g., "feel your stomach muscles tighten") in order to experience the kinesthetic sensations. At the conclusion of each individual session, the skaters were asked to rate to what degree they used a particular imagery perspective, and if they had switched from one perspective to another at any time within the session.. As well, the ease/difficulty to which they were able to see and feel what they were trying to image were also measured at the end of each session.

At the termination of the five week training program, the MIQ and SIQ were again distributed to the skaters. These were again completed at home by the skaters and returned in person or by mail to the primary researcher.

Results

Preliminary Analysis

Before answering our primary research question, it was first necessary to ensure that the participants had maintained their use of a particular imagery perspective

throughout the training program. As well, it was necessary to ensure that all participants had incorporated similar levels of kinesthetic sensations into their imagery, regardless of their adopted imagery perspective. By doing so, we would be able to conclude that any changes in the skaters use of the functions of imagery could be attributed to their adopted imagery perspective, and not to these mediating factors.

Imagery Perspective. To ensure that the skaters had maintained their adopted imagery perspective, scores from the post-imagery session evaluations were analyzed. Recall that the skaters were asked to rate to what extent they used a particular imagery perspective on an eleven-point Likert scale following each imagery session. An independent T-test of scores indicated that the skaters were indeed maintaining their preferred perspective, $t(14) = 13.28$, $p < 0.05$. Specifically, the mean scores for skaters using an external perspective were 9.3, $SD = 0.4$, as compared to the mean score for skaters using an internal perspective which was 1.9, $SD = 1.53$.

Kinesthetic Sensations. Kinesthetic scores of the post-imagery session evaluations were subjected to a 2 Group (external, internal) X 5 Week (weeks 1-5) analysis of variance (ANOVA) with repeated measures on the second factor. This analysis revealed that there was no main effect for group, $F(4,52) = 0.88$, $p > 0.05$, with mean scores for internal being 2.5 and mean scores for external being 2.7, indicating that both groups had similar levels of clarity for their kinesthetic sensations.

Data Analysis

Functions of Imagery. The SIQ scores of the two groups prior to and following the training program are shown in Table 1. The external imagery group showed significant

increases for the cognitive specific, $t(7) = -3.203$, $p < 0.05$, and cognitive general sub-scales, $t(7) = -3.061$, $p < 0.05$. Although, the motivation function scores increased for this group, these failed to reach significance. Dependent T-tests on the SIQ scores for the internal group revealed no significant increase for any of the five sub-scales. A 2 Group (external, internal) X 5 SIQ Sub-scale (CS, CG, MS, MG-A, MG-M) X Test (pre/post) multivariate analysis of variance (MANOVA) with repeated measures on the last two factors revealed no significant main effect for group and no group by test interaction for each of the sub-scales. There was a significant main effect for sub-scale, $F(4,56) = 3.367$, $p < 0.05$. A Tukey post hoc analysis showed that the skaters employed significantly more MG-M images ($M = 5.57$) than the CG ($M = 5.0$), MS ($M = 5.1$) and MG-A ($M = 5.2$) functions of imagery.

Imagery Ability. The MIQ scores of the two groups prior to and following the training program are shown in Table 2. A 2 Group (external, internal) X 2 MIQ Sub-scale (visual, kinesthetic) X 2 Test (pre/post) MANOVA with repeated measures on the last two factors revealed no significant main effects for group or test but only a 3-way interaction, $F(1,14) = 7.13$, $p < 0.05$. A Tukey post hoc analysis showed that both groups had similar levels of improvement for the visual sub-scale, however, the external group did not significantly improve on the kinesthetic sub-scale.

However, when analyzing the post-imagery session evaluations, a 2 Group (external, internal) X 5 Time (week 1-5) ANOVA with repeated measures on the second factor revealed a significant main effect for sub-scale on both the visual and kinesthetic scales. The scores for the post-imagery session evaluations are shown in Table 3. Tukey

Post hoc testing indicated that visual imagery ability significantly improved by week two, whereas scores for kinesthetic imagery ability did not show significance until week four.

Discussion

The purpose of this study was two-fold. The primary purpose was to test Hardy's hypothesis that an external imagery perspective would be the most beneficial imagery perspective for a task that focused on form and body shape. This was accomplished by examining the changes in the functions of imagery after having participated in an imagery training program according to whether the skaters' adopted an internal or external imagery perspective. A secondary purpose was to determine whether imagery ability could improve as a result of a five-week training program.

Purpose 1: Supporting Hardy's Hypothesis

Skaters using an external imagery perspective showed the greatest increases in the functions of imagery following an imagery training program for skills that focused on form and body shape. This was demonstrated by a significant increase in their use of cognitive specific and cognitive general images as well as a trend towards an increase in their use of motivational images. In contrast, skaters that adopted an internal perspective showed no significant increases for any of the functions of imagery. These results, therefore, suggest that athletes are capable of increasing their use of the different functions of imagery through imagery training, but that the demands of the skills being imaged are a moderating variable. Such findings support Hardy's hypothesis that imagery benefits are task specific.

We agree with Hardy's (1997) propositions that the underlying benefits can be related to what is imaged from each perspective and how that ties in with the skills to be later performed. Returning to the pinwheel example mentioned in the introduction, from the external imagery perspective, it could be argued that the skater was provided with visual information concerning the placement of her arms, legs, and head in relation to the formation of the rest of the team, that is the girls in front of her as well as behind her. This information could then be used to make mental corrections to the skill and/or to visualize the exactness needed in the formation--both of these examples use the cognitive-specific functions of imagery. In contrast, the skaters that used an internal imagery perspective were likely seeing their own front arm placement and that of the person immediately in front of them, but no information about what was behind them. This limited visual information may not have allowed them to tap into the cognitive functions of imagery as successfully.

However, because the functions of imagery are orthogonal in nature (Hall et al. 1998), it was also expected that the motivational functions would show increases regardless of the perspective adopted. Contrary to these expectations, neither group significantly increased their use of motivational image. Moreover, a trend was evident wherein the skaters that used an external imagery perspective showed some increases, with no similar increases being seen for the internal group. This suggested that the external perspective may have better fostered the motivational functions of imagery for the synchronized figure skaters that participated. These results support Hardy's (1997) suggestion that internal and external imagery perspectives may exert qualitatively

different motivational influences, however future research should continue to examine these variables. An explanation for the lack of significant findings for the motivation functions of imagery might be attributed to the length of the imagery training program. Five weeks may not have being long enough to show the expected increases in motivational images.

The results of this study contribute new information to the body of knowledge pertaining to imagery perspectives by showing support for Hardy's (1997) hypothesis. Moreover, this was demonstrated in terms of the differential effects on the cognitive and motivational functions of imagery as opposed to the more standard measures of performance often used (Callow & Hardy, 1997; Glisky, Williams & Kihlstrom, 1996; White & Hardy, 1995). As well, in the present study steps were taken to avoid problems that occurred with previous studies examining differences as a result of the imagery perspective adopted. Specifically, we allowed the participants to image from their preferred imagery perspective and included measures to ensure that the participants were imaging from that perspective throughout the entire imagery training. As well, we encouraged the participants to incorporate kinesthetic sensations into their imagery and included measures to ensure that there was no difference between training groups. In doing so, we were able to replicate previous research that has shown that kinesthetic sensations can be experienced through an external perspective (Callow & Hardy, 1997; Glisky, Williams & Kihlstrom, 1996; Gordon, Weinberg & Jackson, 1994; White & Hardy, 1995).

Purpose 2: Imagery Ability

Similar to Rodgers et al. (1991), the imagery training program did result in significant improvements for the skater's visual MIQ scores, regardless of their adopted imagery perspective. However, only skaters imaging from an internal perspective significantly improved their kinesthetic MIQ scores. Interestingly though, a more skating specific measure of imagery ability did reveal improvements in both kinesthetic and visual images for the external as well as internal groups.

When examining how changes in skating specific imagery ability developed, it appeared that the skaters improved visual imagery first, as indicated by the main gains for visual images occurring from week one to week two, and improvement for the kinesthetic images were later, occurring from week three to week four. These findings are similar to Rodgers et al. (1991) who also reported that imagery training had more of an effect on visual imagery early in the training program as compared to the kinesthetic benefits that occurred in the latter aspects of the sixteen week training program. They postulated that these findings may be due to the predominately visually oriented training (i.e., the use of models and demonstrations) that figure skaters receive. As a result, the skaters might spontaneously employ more visual as opposed to kinesthetic images, and would therefore, find it easier to improve visual imagery. Also mentioned was that kinesthetic imagery develops as a function of sport experience. Noteworthy then, is that our sample included novice-level figure skaters, and thus the reasoning provided by Rodgers et al. can also be applied to our results.

Implications for Sport Psychologists

Numerous studies have shown that imagery is an important skill for athletes (for a review, see Hinshaw, 1991-92). Knowing this, it becomes important to determine how this technique would be optimally incorporated into one's training and competitive cycle. The results from this research suggest that sport psychologists and coaches should do a task analysis of the different skills included in the sport that the athlete engages in. With this information, the optimal perspective can then be recommended to the athlete. Skills that contain aesthetic qualities or have an emphasis of form and body shape would benefit more from an external perspective. Conversely, internal perspective would be more beneficial for skills that are simple, well-learned or where the one must respond to external information. As a corollary to this, athletes should be encouraged to practice both perspectives such that they can use either proficiently. This then would provide them with the latitude of imaging from the imagery perspective that best suits the demands of the task.

This recommendation is particularly important if one considers the following comment made by Hall (1997) "to have an athlete change their imagery perspective, even if the nature of the task seems to warrant it, might actually prove detrimental" (p. 311). The results of this study, however, have shown that when imaging from a perspective that does not best suit the demands of the task, the athlete is not receiving the cognitive and motivational benefits of imagery to the same extent as when imaging from the optimal perspective. This is of special consideration, because the functions of imagery have previously been shown to be positively related to performance (Hall et al., 1998).

Therefore, the athlete using the less optimal imagery perspective may not obtain anticipated benefits to performance. Whereas an athlete capable of using both perspectives equally well, will be assured of receiving the cognitive and motivational benefits of using imagery.

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Table 1

SIQ scores for pre- and post-imagery training program

Training group	Pre-test		Post-test	
	M	SD	M	SD
Cognitive Specific				
External	4.88	0.87	5.9*	0.53
Internal	5.29	0.91	5.35	1.43
Cognitive General				
External	4.48	1.07	5.52*	0.65
Internal	4.7	0.66	5.15	1.3
Motivation Specific				
External	4.9	0.93	5.52	1.04
Internal	5.06	1.28	4.96	1.61
Motivation General-Arousal				
External	4.81	1.19	5.17	1.03
Internal	5.27	0.77	5.42	1.17
Motivation General-Mastery				
External	5.13	1.26	5.98	0.65
Internal	5.52	1.03	5.65	1.64

Note: * indicates a significant increase from time 1 to time 2.

Table 2

MIQ scores for pre- and post-imagery training program

Training Group	Pre-test		Post-test	
	M	SD	M	SD
Visual Ability				
External	26.38	9.26	22.13*	10.06
Internal	21.63	10.03	17.5*	9.12
Kinesthetic Ability				
External	24.88	8.74	22.75	10.01
Internal	27.75	8.36	17.63*	9.29

Note: A lower score indicates a higher ability.

* Indicates a significant difference from time 1.

Table 3

Post-imagery Session Evaluation Scores

	Week 1	Week 2	Week 3	Week 4	Week 5
Scale	M	M	M	M	M
Visual	2.8	1.9*	1.9	1.4	1.3
Kinesthetic	3.1	2.8	2.7	2.2*	1.9

Note: A lower score indicates a higher ability.

* Indicates a significant difference from week 1.

Chapter 3

Elaborated Results and Discussion

Elaborated Results and Discussion

The next section contains results that were not included in the article and a general discussion of the thesis in its entirety. Specifically, the results of the primary and secondary purposes of the thesis will be presented with the inclusion of a control group. The original rationale for the inclusion of a control was to obtain a baseline measure of imagery ability and imagery use over a five week period with no intervention. The control group was also used to combat the Hawthorne effect, therefore, it was made-up of synchronized skaters from a second team, located across town, who had no knowledge of the imagery training program. However, analysis of the SIQ and MIQ scores revealed that the control group were quite different from the experimental groups at the outset of the experiment. Moreover, their pre-post test results were also difficult to explain, because they were significantly worse after the five week interval. For this reason, the control group was excluded from the main article, but included in this elaborated results and discussion section. As well, qualitative results will be presented that include the coaches' and skaters' responses to open-ended questions and interviews conducted at the end of the training program. Finally, a general discussion of all the results will be presented along with conclusions and suggestions for future research.

Results

Preliminary Analysis

Other control measures were employed in this study that was not mentioned in the journal article. For example, we included a measure to assess the skater's prior experience with imagery training. As well, as a measure to assess to what extent the control group had used imagery during the five week time frame that the experimental group had been involved with the training program. This was to ensure that any differences between the two groups at the post-test could be attributed to the experimental group's participation in an imagery training program.

Prior Experience With Imagery Training. Prior to the start of the training program, the skaters completed a skater biography (Appendix E) that asked them if they had any experience with an imagery training program, who had delivered the program, and to describe the program or any other imagery that they might have done. Results of this skater biography revealed that two of the internal imagers (25%) had prior experience with imagery training, one had instruction from her single's coach to use imagery at competitions, and the other had used Terry Orlick's imagery tapes. Three of the external imagers (38%) had prior experience with imagery training, two had been instructed by their single's coach to use imagery at competitions, and the third skater did not state who had delivered the program. Finally, six of the control group (75%) had been instructed by their coach to use imagery for either single skating or soccer.

Control Group. To assess to what extent the control group had used imagery during the time frame of the intervention, the skaters were asked to rate to what extent

they had used imagery on a seven-point Likert scale (1= much less than normal, 7= much more than normal) (Appendix G). Mean scores indicated that the control group was using imagery less than normal ($M = 3.8$).

Data Analysis

Functions of Imagery. The SIQ scores of the three groups prior to and following the training program are shown in Table 1. A 3 Group (external, internal, control) X 5 SIQ Sub-scale (CS, CG, MS, MG-A, MG-M) X Test (pre/post) multivariate analysis of variance (MANOVA) with repeated measures on the last two factors revealed a significant main effect for sub-scale, $F(4,84) = 6.45$, $p < 0.05$. A Tukey post hoc analysis showed that the skaters employed significantly more MG-M images ($M = 5.53$) than the CG ($M = 5.1$), MS ($M = 5.0$) and MG-A ($M = 5.0$) functions of imagery. This analysis also revealed a significant group by sub-scale interaction, $F(2,21) = 4.153$, $p < 0.05$. A Tukey post hoc analysis showed that the external group had significantly increased their SIQ scores, whereas, the control group had significantly decreased their SIQ scores. There were no significant differences for the internal group on any of the five sub-scales. To probe further into what sub-scales were affected, a univariate analysis was conducted. These analysis revealed that the external imagery group showed significant improvements for the CS, $t(7) = -3.203$, $p < 0.05$, and CG sub-scales, $t(7) = -3.061$, $p < 0.05$. Although, they did improve on the motivation functions, these failed to reach significance. The control group significantly decreased their scores for the CS, $t(7) = 3.257$, $p < 0.05$, MS, $t(7) = 2.325$, $p < 0.05$, and MG-A sub-scales, $t(7) = 2.612$, $p < 0.05$.

Imagery Ability. The MIQ scores of the three groups prior to and following the training program are shown in Table 2. A 3 Group (external, internal, control) X 2 MIQ Sub-scale (visual, kinesthetic) X 2 Time (test/re-test) MANOVA with repeated measures on the last two factors revealed a test for sub-scale was nearing significance, $F(2,21)=4.04$, $p = 0.58$, indicating that the groups were better at visual imagery. There was also a significant group by time interaction, $F(2,21)=7.217$, $p < 0.05$. Tukey post hoc analysis revealed that the control group had significantly increased their MIQ scores from the pre- to post-test whereas the internal group had significantly decreased their scores from time 1. Because the MIQ is scored in such a way that a lower score indicates a higher ability, this significant increase indicated that the control group had got worse during the five week interval. Further univariate analysis indicated that this significant increase was for both the visual, $t(7)=3.134$, $p < 0.05$, and kinesthetic sub-scales, $t(7)=2.348$, $p \leq 0.05$.

Qualitative data

Responses To Open-ended Questions. Thirteen of the skaters returned the open-ended questions that were designed to assess their perceived benefits from participating in the imagery training program. Similar responses were given by the skaters regardless of their adopted imagery perspective. In response to the question, "What have you learned from this imagery training program?", the skaters said that they had learned how to calm down and how to use imagery. When asked if the quality of their images had improved because of the imagery training program, 11 out of the 13 skaters (85%) felt that they had improved. When asked to describe how had the quality of their images improved, the types of responses given were that their images had become more vivid and clearer, and

they were better able to feel the images. Only 6 out of the 13 skaters (46%) felt that their use of imagery had changed. These changes were described as being able to focus on different aspects of their skating performance. This is highlighted by a quote from a skater who said “ I can use (imagery) to work on more specifics, i.e. posture, instead of not emphasizing anything special.” Finally, when asked if they would continue to use imagery at the termination of the training program, 11 out of the 13 skaters (85%) that returned their answers to the researcher responded yes. Their reasons for continuing with imagery included improved skating performance and because imagery helped them to be more calm and focused during competitions. Nine of the skaters responded to the question regarding to what extent they used imagery outside of the training program. These results are reported in table 3.

Interviews. The skaters being interviewed were asked if imagery helped them to calm down and how this was accomplished. All six felt that imagery helped them to calm down. Reasons given by the skaters were the breathing exercises performed at the beginning of each session, closing their eyes, and clearing their mind of all other things. Also, the breathing exercises were useful in helping the team to calm down when they were all together. This is highlighted by skater #2 who said “... everyone is excited, but then you start to breath and every one calms down”.

Three of the skaters interviewed had adopted an external imagery perspective, and three had adopted an internal perspective. When asked if they were able to focus on their body was placed, the skaters using an internal perspective described how they used kinesthetic sensations. For example, skater #1 said “it was more like feeling it than

seeing it...". As well, skater #3 said "you can feel the muscles, and you can feel where your shoulders are, where your head is, and you see, if you are looking very far back, you can see the person's bun...". In comparison, the skaters using an external perspective described how they were able to see the desired body shape. For example, skater #6 said "I was able to see myself straight and my head back". Skater #2 described why she had switched from an internal to an external perspective following the first session because she thought "the inside was harder to see".

Also curious, was how the skaters felt that imagery had influenced their performance at the National Championships which were held immediately following the completion of the training program. All six had used imagery at the competition, reasons given were for improved performance, to calm down, to feel more confident, to prepare for the stress and tension, and to focus better. For example, the effect of imagery on the skater's performance is highlighted by skater #1 who said "I was calmer at National than I was at sectionals...I pictured myself giving my best performance ever, and that is what I did on the ice". As well as by skater #3 who said "(I) wasn't nervous of performing in front of an audience because I had already seen everything before in my mind".

When asked whether the skaters felt that they would continue to use the exercises that they had learned on their own or would they prefer a coach or sport psychology consultant to guide them, all six skaters said that they would continue to use the exercises on their own. Three skaters said that it would also be helpful to have someone else. For example, skater #3 said "I prefer having someone else because that way they can answer any questions if you have any, and sometimes they come up with more ideas".

Coach's Perceptions. The coach felt that improvements in the skater's body position and presentation could be attributed to the imagery training program. The reason given for these improvements were that the skaters had a better understanding of the importance of presentation and had acquired the ability to focus on their posture and presentation. The coach also felt that the imagery training had a positive effect on the skater's performance at the National Championships, because the skaters were more relaxed and better able to control their breathing. During practices that followed the imagery training sessions, the coach found that she was able to gain the skater's attention quicker and that they were less "chatty", more relaxed and listened better. The skaters were also able to react more quickly to cue words, i.e., "lock elbows", "bend knees", "chins up".

Discussion

Control Group.

One of the most intriguing findings of this study was that the control group had significantly decreased their use of the functions of imagery as well as having a significantly lower imagery ability at the post-test. These results are even more intriguing when the time of year is considered. The time frame of the data collection was during the six weeks leading up to the National Synchronized Skating Championships, the most important competition of the year for the skaters participating in this study. The control group completed the post-test questionnaires a week prior to this competition. For this reason, it was expected that the control group would maintain or even slightly increase

their use of the different functions. But, the results were completely contrary to this expectation.

We can postulate that these results may have occurred because the control group reported using imagery less than normal during the five weeks between the two measures. An increase in physical training may also explain why the control group's use of the different functions significantly decreased from the pre- to post-test, because the skaters had less time to spend on mental training. As well, it is important to consider that the control group was made up of skaters from a novice level synchronized team located across town coached by a different person from the skaters in the experimental group. Therefore, there might be a difference in the coach's attitude towards incorporating sport psychology in the skater's training. The control group also had scores at the pre-test, as shown in table 1, that approached a significant difference from the experimental groups. For this reason, the control group was not included in the article as a baseline measure. We might therefore postulate that these scores were inflated at the pre-test, perhaps due to the fact that 75% of the control group had prior experience with imagery training compared to 25% of the internal group and 38% of the external group. It is also possible that the control group was trying to anticipate what results the researcher was hoping to achieve. The post-test scores might, therefore, be a more accurate reflection of the control group's use of the different functions of imagery and imagery ability because the novelty of completing questionnaires had worn off. In hindsight, it would have been interesting to include the control group skaters in the qualitative interviews that were held after the second measure of imagery use and imagery ability were taken. This would have

provided an understanding as to why the control group's scores were so contrary to expectation.

Perceived Benefits

The qualitative data collected at the completion of the end of the imagery training program was used as a method of confirming that the skaters had maintained their adopted imagery perspective. Also, this provided an opportunity to gain insight into the perceived benefits of the skaters from participating in the imagery training program.

One of the most interesting findings that emerged through response to open-ended questions and interviews, was the skaters' perception that their skating performance had improved as a result of the imagery training. This of interest because we were discouraged from using performance measures for a five-week intervention study. The reason being, that this time frame would not be long enough for improvements in performance to emerge. However, the skater's perceived that their improvements in performance were related to improved positioning of the arms, legs, posture, head and facial expression. Because these body positions were the focus of the imagery, the led to skaters being able to break down their imagery to focus on these different aspects of the skill instead of imaging with no specific purpose in mind.

Furthermore, according to the coach, the imagery training had resulted in more effective on-ice practices because she was able to gain the skater's attention quicker, the skaters were less chatty and responded more quickly to cue words. As well, the skaters perceived that the imagery training had benefited their competitive performance in that they were able to apply the skills learned in the training to preview what they would

experience at the National Championships as well as to calm down before the actual performance.

Limitations

This study has several limitations that need to be acknowledged. First of all, the low sample size was a weakness. But, although the power was low, a significant difference was still obtained for the cognitive functions of imagery. The low sample size can be attributed to our interest in studying a synchronized skating population, and to the number of control measures that were implemented to resolve methodological problems that existed in previous studies that examined imagery perspective. A second limitation pertains to internal validity, because the skaters were not randomly assigned to either an experimental or a control group. Instead, the control group was selected from a second team, in order to combat the Hawthorne effect. We felt that it would not have been possible to have a control group made up from the same team that participated in the training program, because this would have affected the skater's acceptance and commitment to the intervention (Rodgers et al., 1991). Finally, the time frame of the study may have been too short to show the expected increases for the motivational functions of imagery and for the general measure of imagery ability. However, the five-week time frame had been selected based on previous studies by White and Hardy (1995) and Callow and Hardy (1996) who showed significant increases with imagery studies ranging in length from one week to four weeks.

Directions for future research

This study is the first to link imagery perspective with the different functions of imagery. This was accomplished by showing the cognitive and motivational effects of imaging from an external perspective for tasks that focus on form and body position. However, more research is needed to assess if the reverse results would occur when imaging a task that would be more beneficial from an internal perspective. But, it would first be important for researchers to perform a task analysis for the sport being studied in order to have a better grasp of the task demands present. Although Hardy (1997) has hypothesized for certain types of tasks what would be the optimal imagery perspective, there are other types of tasks that have yet to be identified. For example, tasks that require aiming at a target might be more beneficial to image from an internal perspective, whereas external imagery may be used to enhance an athlete's competitive drive by comparing themselves to the generated image.

Another suggestion for future research, is to lengthen the imagery training program to an entire season. In doing so, researchers will be better able to assess changes in sport-specific and general imagery ability, and to track the use of the different functions of imagery across the season. This would also provide the researcher with an opportunity to better assess how performance might be related to imagery ability and imagery use.

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Table 1

SIQ scores for pre- and post-imagery training

Training group	Pre-test		Post-test	
	M	SD	M	SD
Cognitive Specific				
External	4.88	0.87	5.9*	0.53
Internal	5.29	0.91	5.35	1.43
Control	5.88	0.59	4.88*	0.95
Cognitive General				
External	4.48	1.07	5.52*	0.65
Internal	4.7	0.66	5.15	1.3
Control	5.4	0.64	5.02	0.72
Motivation Specific				
External	4.9	0.93	5.52	1.04
Internal	5.06	1.28	4.96	1.61
Control	5.25	0.83	4.23*	0.85
Motivation General-Arousal				
External	4.81	1.19	5.17	1.03
Internal	5.27	0.77	5.42	1.17
Control	4.96	0.56	4.33*	0.57
Motivation General-Mastery				
External	5.13	1.25	5.98	0.65
Internal	5.52	1.03	5.65	1.64
Control	5.71	0.82	5.23	0.73

Note: * indicates a significant difference from pre- to post-test.

Table 2

MIQ scores for Pre- and Post test

Training Group	Pre-test		Post-test	
	M	SD	M	SD
Visual Ability				
External	26.38	9.26	22.13	10.06
Internal	21.63	10.03	17.5	9.12
Control	16.5	6.0	26.5*	14.41
Kinesthetic Ability				
External	24.88	8.74	22.75	10.01
Internal	27.75	8.36	17.63	9.29
Control	21.25	7.03	29.5*	7.45

Note

A lower score indicates a higher ability.

* Indicates a significant difference

Table 3

Use of imagery outside of the training program

Times per week	Number of skaters
0	4
1-2	2
3-4	2
5-6	1
7+	0

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Appendix A

Contribution of Collaborators

Contribution of Collaborators

I had the original idea of examining the area of mental imagery. From reading the imagery literature and through numerous discussions with Dr. Ste-Marie, we were able to develop a research question. Together, we created a methodology for the thesis proposal, with the input of Dr. Craig Hall from the University of Western Ontario and Dr. Lew Hardy from the University of Wales, as well as other members of Dr. Ste-Marie's lab, such as Kavita Prakash, Gail Taylor and Clare Mac Mahon. I then wrote the original draft of my proposal document, which was edited by Dr. Ste-Marie. I continued to write several drafts and Dr. Ste-Marie edited them all, until we felt that the document was ready for the proposal.

Following the proposal, several changes were made to the methodology based on the comments of Dr. Michelle Fortier and Dr. Terry Orlick. Specifically, open-ended questions were added to the end of the imagery training program in order to assess the skaters perceived benefits from participating in the training, as well as an interview with a small number of the skaters in order to gain a better understanding as to what these benefits were.

The population of study was also changed to synchronized figure skaters because of the difficulty of finding enough single skaters to participate in the study. I contacted both the coach and the manager of the team to gain permission to conduct the study. In terms of data collection, I collected all the questionnaires and conducted all the interviews. I also read the imagery scripts to the skaters for each training session, with the exception of one session, which was a taped recording of myself reading an imagery script.

All data entry was done by myself. Dr. Ste-Marie advised me on what statistical analysis was required to answer our research question. Dr. Craig Hall provided help through a number of e-mails and meetings to the interpretation of results along with Dr. Ste-Marie and other members of the lab group.

Once the data was analyzed, I wrote the original draft of the article, and refined the proposal document. As during the preparation of the proposal document, Dr. Ste-Marie edited all documents until we were prepared to present the thesis defense. The process of writing the entire thesis document began in the summer of 1998 and was completed by December of the same year.

Appendix B

Revised Methodology

Method

Subjects:

A minimum of thirty competitive synchronized figure skaters will be recruited to participate in this study from two synchronized skating team in the Ottawa area. The skaters will be from the novice level, and their expected age range is 9 to 15 years. The researcher will ask permission from the executive and coaches of the team to approach the skaters. After permission is granted, a meeting will be held with the parents and skaters in order to explain the study and to obtain informed consent (appendix N). In order to combat the Hawthorne effect, the control group (n=10) will be made up of skaters from a different synchronized skating team, who will not have contact with the skaters participating in the training program.

Instruments:

The *Movement Imagery Questionnaire* (MIQ; Hall & Pongrac, 1983) (appendix C) will be used as a participant screening device to ensure that all participants can image both kinesthetic and visually. The MIQ (Hall & Pongrac, 1983) asks the athlete to perform 18 different imagery tasks, and to rate the ease/difficulty with which they are able to do these tasks on a 7-point rating scale. The MIQ is scored in such a manner that a low score indicates a higher ability. Atienza, Balaguer and Garcia-Merita (1994) reported that analysis of the MIQ had resulted in an acceptable internal consistency, with alpha coefficients for the total scale being 0.90, 0.89 for the visual sub-scale, and 0.88 for the kinesthetic sub-scale. These coefficients are similar to those reported by Hall, Pongrac & Buckolz (1985).

The Sport Imagery Questionnaire (SIQ; Hall, Mack & Paivio, 1997) (Appendix D) will be used to measure the use of the different imagery functions. The SIQ is a 30-item self-report questionnaire that asks athletes to rate on a 7-point scale (1= rarely and 7= often) how often they utilize 5 different types of images: cognitive general (CG), cognitive specific (CS), motivation general-mastery (MG-M), motivation general-arousal (MG-A), and motivation specific (MS). Moritz, Hall, and Vadcoz (1996) reported that preliminary analysis from three experiments had indicated adequate internal reliabilities for the five sub-scales, with Alpha coefficients ranging from .57 to .89. Interscale correlations ranged from -.31 to .22, indicating that the SIQ sub-scales were correlated but represented different constructs.

Following each imagery session, the skaters will rate their use of a particular imagery perspective on an eleven-point Likert scale (10 indicating a completely external perspective and 0 indicating a completely internal perspective) (Appendix F). As well, the skaters will be asked to rate the clarity of their visual and kinesthetic images on the same rating scale used in the MIQ (Hall & Pongrac, 1983).

Procedure:

Prior to the start of the imagery training program, the skaters will complete the MIQ and SIQ. At this time, the skaters will receive an explanation of the differences between an external and an internal imagery perspective, and will be encouraged to image from their preferred imagery perspective throughout the training program. The imagery training program will consist of two 15 minute sessions a week for five weeks, designed such that it will not demand too much of the skater's time outside their skating schedule,

but be of sufficient length to generate the expected benefits. Each session will focus on posture, facial expression, and placement of the arms and legs in synchronized figure skating skills. As well, the skaters will be asked to image both practice and competitive situations in order to tap into both the cognitive and motivational functions of imagery.

At the start of each imagery session, the researcher will remind the skaters to image from their preferred imagery perspective and to not switch between the two. As well, the skaters will be asked to incorporate kinesthetic sensations into their imagery. Each session will consist of the researcher reading an imagery script to the skaters (Appendix K & L), except for one session which will be audio-taped with the voice of the researcher, and given to the skaters to perform on their own time. The reason for this audio-taped session will be that the team will be away for a competition, and will not be able to meet with the researcher.

The same measures as that given at the beginning of the study will be repeated after the intervention. In addition, the skaters and coaches will be asked several open-ended questions in order to assess what were their perceived benefits from participating in the imagery training program, and to rate to what extent they had been using imagery outside of the training program (Appendix H). As well, a selected number of skaters will be asked to participate in an interview session with the researcher. The purpose of this interview will be to discuss more in depth with the individual skaters about their perceived benefits of the imagery training program. The interview guide will be developed based on the responses given in the open-ended questions (Appendix J). Finally, the control group will be asked to rate to what extent they have used imagery during the five

weeks between the pre- and post-test, and to describe if and how their use of imagery had changed (Appendix G).

Data Analysis

Descriptive statistics will be used to measure the extent the skaters use each of the five sub-scales on the SIQ. To determine the effects of training internal and external visual imagery perspectives on the functions of imagery, a MANOVA will be performed on the five SIQ variables. If there is significance, further univariate analysis will be conducted. The same data analysis will be used for the measure of imagery ability.

Appendix C

Movement Imagery Questionnaire

MOVEMENT IMAGERY QUESTIONNAIRE**Information Sheet****INTRODUCTION:**

The Movement Imagery Questionnaire (MIQ) is designed to measure individual differences in visual and kinesthetic imagery of movements. It has been found to possess a high reliability (visual .828; kinesthetic .834) when administered separately to individuals in a quiet room, free from distraction.

SCORING:

The questionnaire contains two sub-scales.

- To obtain the visual imagery score, sum the ratings given to the following items: 1, 3, 5, 7, 11, 13, 15, 17, and 18.
- To obtain the kinesthetic imagery score, sum the ratings given to the following items: 2, 4, 6, 8, 10, 12, 14, and 16.
- The minimum score that can be achieved is a 9 (high imager), and the maximum score is 63.

EQUIPMENT:

- The only equipment necessary to administer the MIQ-R is a pencil and an exercise (floor) mat.

1. **STARTING POSITION:** Make a fist with your dominant hand (the hand you write with) and then place this hand on the same shoulder (e.g., right hand on right shoulder) such that your elbow is pointing directly in front of you.
- ACTION:** Extend your elbow so that your hand leaves your shoulder and straight in front of you parallel to the floor. Keep your hand in. Make this movement **slowly**.
- MENTAL TASK:** Assume the starting position (exactly described above). Form as **clear and vivid a mental image** as possible of the movement just performed. **DO NOT PERFORM THE MOVEMENT.** Now rate the ease/difficulty with which you were able to do this mental task.
- Rating: _____

2. **STARTING POSITION:** Stand with your feet and legs together and your arms at your sides.
- ACTION:** Raise your right knee as high as possible so that you are starting on your left leg with your right leg flexed (bent) at the knee. Now lower your right leg so you are once again standing on two feet. Perform these actions **slowly**.
- MENTAL TASK:** Assume the starting position. Attempt to **feel** yourself making the movement just performed without actually doing it. Now rate the ease/difficulty with which you were able to do this mental task.
- Rating: _____

3. **STARTING POSITION:** Stand with your feet slightly apart and your hands at your sides.
- ACTION:** Bend down low and then jump straight up in the air as high as possible with both arms extended above your head. Land with both feet apart and lower your arms to your sides.
- MENTAL TASK:** Assume the starting position (exactly described above). Form as **clear and vivid a mental image** as possible of the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.
- Rating: _____

4. **STARTING POSITION:** Stand with your feet slightly apart and your hands at your sides.
- ACTION:** Jump upwards and rotate you entire body to the left such that you land in the same position in which you started. That is, rotate to the left in a complete (360 degree) circle.
- MENTAL TASK:** Assume the starting position. Attempt to **feel** yourself making the movement just performed without actually doing it. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

5. **STARTING POSITION:** Extend the arm of your non dominant hand straight out to your side so that it is parallel to the ground, palm down.
- ACTION:** Move your arm forward until it is directly in front of your body (still parallel to the ground). Keep your arm extended during the movement, and make the movement **slowly**.
- MENTAL TASK:** Assume the starting position (exactly described above). Form as **clear and vivid a mental image** as possible of the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

6. **STARTING POSITION:** Stand with your feet and legs together and your arms at your sides.
- ACTION:** Raise your left leg as high as possible keeping the leg extended (do not bend your left knee). At the same time keep your support (right) leg straight. Now lower your left leg so you are once again standing on two feet. Perform these actions **slowly**.
- MENTAL TASK:** Assume the starting position. Attempt to **feel** yourself making the movement just performed without actually doing it. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

- 7. STARTING POSITION:** Stand with your feet slightly apart and your arms fully extended above your head.
- ACTION:** Slowly bend forward at the waist and try and touch your toes with your fingertips (or if possible, touch the floor with your fingertips or your hands). Now return to the starting position, standing erect with your arms extended above your head.
- MENTAL TASK:** Assume the starting position (exactly described above). Form as **clear and vivid a mental image** as possible of the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

- 8. STARTING POSITION:** Make a fist with your non dominant hand. Extend your arm above your head keeping your hand in a fist. Keep your arm at your side.
- ACTION:** Swing your extended arm straight down to your side as **rapidly** as possible. Keep your arm extended and your hand clenched.
- MENTAL TASK:** Assume the starting position. Attempt to **feel** yourself making the movement just performed without actually doing it. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

- 9. STARTING POSITION:** Stand in front of the floor (exercise) mat with your feet together and your arms at your sides.
- ACTION:** Perform a front somersault (roll) on the mat and finish in a standing position.
- MENTAL TASK:** Assume the starting position. Attempt to **feel** yourself making the movement just performed without actually doing it. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

10. STARTING POSITION: Make a fist with your dominant hand (the hand you write with) and then place this hand on the same shoulder (e.g., right hand on right shoulder) such that your elbow is pointing directly in front of you.

ACTION: Extend your elbow so that your hand leaves your shoulder and is straight in front of you parallel to the floor. Keep your hand in a fist. Make this movement **slowly**.

MENTAL TASK: Assume the starting position. Attempt to **feel** yourself making the movement just performed without actually doing it. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

11. STARTING POSITION: Stand with your feet and legs together and your arms at your sides.

ACTION: Raise your right knee as high as possible so that you are starting on your left leg with your right flexed (bent) at the knee. Now lower your right leg so you are once again standing on two feet. Perform these actions **slowly**.

MENTAL TASK: Assume the starting position (exactly described above). Form as **clear and vivid a mental image** as possible of the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

12. STARTING POSITION: Stand with your feet slightly apart and your hands at your sides.

ACTION: Bend down low and then jump straight up in the air as high as possible with both arms extended above your head. Land with both feet apart and lower your arms to your sides.

MENTAL TASK: Assume the starting position. Attempt to **feel** yourself making the movement just performed without actually doing it. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

13. STARTING POSITION: Stand with your feet slightly apart and your hands at your sides.

ACTION: Jump upwards and rotate you entire body to the left such that you land in the same position in which you started. That is, rotate to the left in a complete (360 degree) circle.

MENTAL TASK: Assume the starting position (exactly described above). Form as **clear and vivid a mental image** as possible of the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

14. STARTING POSITION: Extend the arm of your non dominant hand straight out to your side so that it is parallel to the ground, palm down.

ACTION: Move your arm forward until it is directly in front of your body (still parallel to the ground). Keep your arm extended during the movement, and make the movement **slowly**.

MENTAL TASK: Assume the starting position. Attempt to **feel** yourself making the movement just performed without actually doing it. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

15. STARTING POSITION: Stand with your feet and legs together and your arms at your sides.

ACTION: Raise your left leg as high as possible keeping the leg extended (do not bend your left knee). At the same time keep your support (right) leg straight. Now lower your left leg so you are once again standing on two feet. Perform these actions **slowly**.

MENTAL TASK: Assume the starting position (exactly described above). Form as **clear and vivid a mental image** as possible of the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

16. STARTING POSITION: Stand with your feet slightly apart and your arms fully extended above your head.

ACTION: Slowly bend forward at the waist and try and touch your toes with your fingertips (or if possible, touch the floor with your fingertips or your hands). Now return to the starting position, standing erect with your arms extended above your head.

MENTAL TASK: Assume the starting position (exactly described above). Attempt to **feel** the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

17. STARTING POSITION: Make a fist with your non dominant hand. Extend your arm above your head keeping your hand in a fist. Keep your arm at your side.

ACTION: Swing your extended arm straight down to your side as **rapidly** as possible. Keep your arm extended and your hand clenched.

MENTAL TASK: Assume the starting position (exactly described above). Form as **clear and vivid a mental image** as possible of the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

18. STARTING POSITION: Stand in front of the floor (exercise) mat with your feet together and your arms at your sides.

ACTION: Perform a front somersault (roll) on the mat and finish in a standing position.

MENTAL TASK: Assume the starting position (exactly described above). Form as **clear and vivid a mental image** as possible of the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.

Rating: _____

Appendix D

Sport Imagery Questionnaire

Sport Imagery QuestionnaireInformation Sheet

The SIQ consists of five sub-scales that measure the cognitive and motivational functions of mental imagery used by athletes. The five sub-scales and the corresponding items are:

Cognitive Specific

item 8
item 11
item 13
item 18
item 20
item 27

Cognitive General

item 1
item 5
item 9
item 16
item 19
item 29

Motivation Specific

item 2
item 7
item 10
item 12
item 14
item 25

**Motivation General-
Arousal**

item 4
item 6
item 15
item 17
item 22
item 24

**Motivation General-
Mastery**

item 3
item 21
item 23
item 26
item 28
item 30

The mean sub-scales (e.g., CS, CG, MS, MG-A, and MG-M) can be calculated for a subject by summing the item scores (ratings) for each sub-scale and dividing by six. Each item is rated on a 7-point scale from 1 = rarely to 7 = often, therefore, a higher score reflects greater imagery use.

Sport Imagery Questionnaire

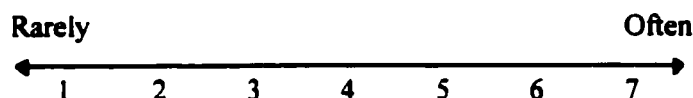
Craig R. Hall, Diane E. Mack and Allan Paivio, University of Western Ontario

Please fill in the blank or circle the appropriate answer:

Sport: _____ Sex: M / F

Level of Competition: Recreational Local Provincial Varsity National

Athletes use mental imagery extensively in their training and in conjunction with competition. Imagery serves as two functions. The motivational function of imagery can represent emotion arousing situations as well as specific goals and goal-oriented behaviors. The cognitive function entails the mental rehearsal of skills and strategies of play. A strategy is a plan or method of achieving some goal. In sport, this often referred to as a game plan. For example, playing a *pressure game* to create turn overs is a possible strategy to use in basketball, and this could be done executing various skills and tactics (i.e., skills put together in sequence) such as presses and man on-man defenses. Another example of a strategy would be playing a *baseline game* in tennis; how this is actually accomplished (i.e., the skills performed) would vary considerably over the course of the game. This questionnaire was designed to assess the extent to which you incorporate imagery into your sport. Any statement depicting a function of imagery that you rarely use should be given a **low rating**. In contrast, any statement describing a function of imagery which you use frequently should be given a **high rating**. Your ratings will be made on a seven-point scale, where *one* is rarely or never engage in that kind of imagery end of the scale and *seven* is the often engage in that kind of imagery end of the scale. Statements that fall within these two extremes should be rated accordingly along the rest of the scale. Read each statement below and fill in the blank the appropriate number from the scale provided to indicate the degree to which the statement applies to you when you are practicing or competing in your sport. Don't be concerned about using the same numbers repeatedly if you feel they represent your true feelings. Remember, there are no right or wrong answers, so please answer as accurately as possible.



- (1) I make up new plans/strategies in my head. _____
- (2) I image the atmosphere of winning a championship (e.g., the excitement that follows winning a championship). _____
- (3) I image giving 100% during an event/game. _____
- (4) I can re-create in my head the emotions I feel before I compete. _____
- (5) I image alternative strategies in case my event/game plan fails. _____
- (6) I image myself handling the stress and excitement of competitions and remaining calm. _____
- (7) I image other athletes congratulating me on a good performance. _____

- (8) I consistently control the image of a physical skill. _____
- (9) I image each section of an event/game (e.g., offense vs. defense, fast vs. slow).

- (10) I image the atmosphere of receiving a medal (e.g., the pride, the excitement, etc.).

- (11) I can easily change an image of a skill. _____
- (12) I image the audience applauding my performance. _____
- (13) When imaging a particular skill, I consistently perform it perfectly in my mind.

- (14) I image myself winning a medal. _____
- (15) I image the stress and anxiety associated with competing. _____
- (16) I image myself continuing with my game/event plan even when performing poorly.

- (17) When I image a competition, I feel myself getting emotionally excited.

- (18) I can mentally make corrections to physical skills. _____
- (19) I imagine executing entire plays/programs/sections just the way I want them to happen in an event/game. _____
- (20) Before attempting a particular skill, I imagine myself performing it perfectly.

- (21) I image myself being mentally tough. _____
- (22) When I image an event/game that I am participating in, I feel anxious. _____
- (23) I imagine myself appearing self-confident in front of my opponents. _____
- (24) I imagine the excitement associated with competing. _____
- (25) I image myself being interviewed as a champion. _____
- (26) I image myself to be focused during a challenging situation. _____
- (27) When learning a new skill, I imagine myself performing it perfectly. _____
- (28) I imagine myself being in control in difficult situations. _____
- (29) I imagine myself successfully following my game/event plan. _____
- (30) I image myself working successfully through tough situations (e.g., a power play, sore ankles, etc.). _____

Appendix E

Skater Biography



Name: _____

Age: _____

Date of birth (y/m/d): _____

Have you ever participated in an imagery training program? yes or no

If yes, who delivered this program?

Coach

Sport psychology consultant

Other: _____

Please describe this program or any or other imagery training that you have done.



There are two different perspectives that you can take when performing mental imagery:

- An external imagery perspective is when you see yourself skating from outside of your body, as if you are watching yourself on video.
- An internal imagery perspective is when you see what see as if you are actually skating?

When you use imagery, do you see yourself skating from the outside (as if watching a video) or from the inside (as if you are actually inside yourself performing)?

Inside View 0 1 2 3 4 5 6 7 8 9 10 Outside View
 Half-and half

Appendix F

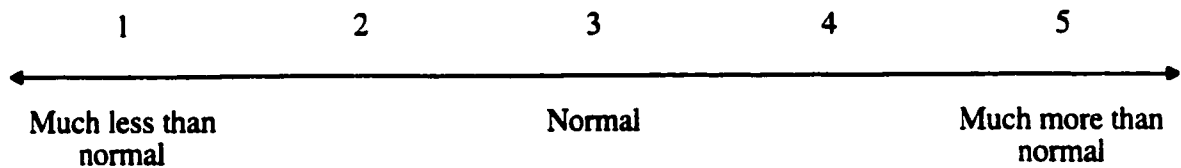
Post-Imagery Session Evaluation Form

Appendix G

Post-Test Questions for the control group

Name: _____

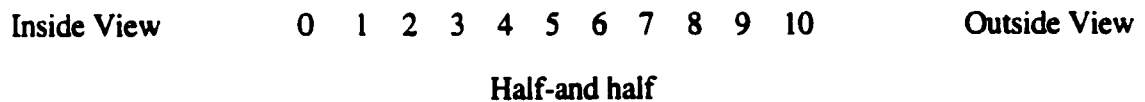
1. Rate your use of mental imagery during the last five weeks.



2. Have you changed the way you use mental imagery in the past five weeks?

yes or no If yes, how?

3. When you use imagery, do you see yourself skating from the outside (as if watching a video) or from the inside (as if you are actually inside yourself skating)?



Appendix H

Open-ended questions for the skaters

Instructions:

Please answer the following questions with total honesty. There is no right or wrong answer, I am simply interested in your response. Your answers will remain completely anonymous.

Thank you!

1. What have you learned from this imagery training program?

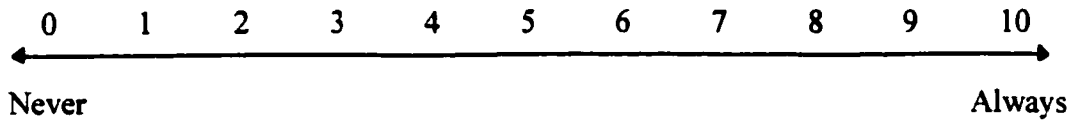
2. During the past five weeks, to what extent did you use mental imagery outside of the training program?
 - a) 0
 - b) 1-2 times per week
 - c) 3-4 times per week
 - d) 5-6 times per week
 - e) 7+ times per week

3. Has the **quality** of your images improved with this imagery training program?
yes or no If yes, how?

4. Do you feel that your **use** of imagery has changed with this imagery training program?
yes or no If yes, how?

5. When performing the imagery exercises, which imagery perspective were you imaging from? The outside view (as if watching a video) or from the inside (as if you are actually inside yourself skating)?
outside or inside

6. Did you ever switch between the two perspectives?



Feel free to comment:

7. Do you plan on continuing to use the exercises from this training program?

yes or no Why or why not?

Thank you for participating in the imagery training program!!!



Appendix I

Open-ended questions for the coach

Appendix J

Interview Guide


Background

- How old are you?
 - How many years have you been skating?
 - How many years have you been skating on a synchronized skating team?
 - Before this training program, had you ever done imagery before?
-
- **Main Questions**
 - Did the imagery training help your skating performance?
 - What did you learn from the imagery training?
 - Does imagery help to calm you down?
 - Did you use imagery at the Nationals competition?
 - How has your imagery improved with this training program?
 - Have you changed the way you use imagery because of this training program?
 - Which perspective were you imaging from, inside or outside?
 - Did you ever switch between the two? When?
 - Will you continue to use imagery now that the training program is over?
 - Will you be able to continue using the exercises on your own, or would you prefer to have a sport psychology consultant or your coach guide you through imagery?

Appendix K

Example of an imagery script:

Practice Setting

Imagery Training ScriptSession #1- Practice Session

Before we begin, I would like to remind you that it is very important to try and follow the instructions as exactly as possible. Remember that imagery is a mental skill that takes practice in order to improve. So don't worry if it doesn't go perfectly the first time, because you will get plenty of opportunity to practice over the next few weeks. Now in order to begin, you need to become very relaxed. I want you to get into a comfortable position. Take three deep, slow breaths that will fill your lungs and chest with air. Breathe in ... and breathe out all the air completely... breathe in... breathe out... breathe in... breathe out... Good, your mind is relaxed, and ready to start our imagery session.

Transport yourself outside of this room. Travel down the hallway that will take you to the doors that will lead you to the ice surface. Open these doors, and stand beside the boards with the rest of your team. While you wait for your practice session to start, look around at the rink, the walls, the ice surface, and the stands. You feel strong and compact in your skating dress. Your body is warm, energized, and ready to skate. Take your guards off, and step onto the ice surface. Slide your blades back and forth, and get the feel of the ice. Begin your stroking forward around the rink. Feel your knees bending and your blades pressing into the ice. Feel the cold air against your cheeks, and the wind blowing in your hair. Listen to the sounds your blades make as you move across the ice. Your body feels strong and powerful. You flow gracefully across the ice surface. Now turn backwards, and begin stroking around the rink. After a turn around the rink, you feel

warmed up. Skate over to where your team starts it's warm up block. Head to your position in line. Picture your teammates standing beside you. For the next few minutes, see yourself and the team skating the warm up block. Stop your imagery when your team reaches the opening position of the routine. Let me know when you have reached the opening position by opening your eyes.

Take a moment to relax, and slow your breathing down. Take some long deep breaths. Now return to the opening position of the program. While you stand in this position, begin to focus on the program that you are about to skate. Begin skating the program. Image only the first section of your program, up until the four spoke pin wheel becomes a circle, and there is a change in music. Again, open your eyes when you reach this point in the program.

Good. Now return to the opening position. This time, try to take the imagery up a notch. Can you make the picture clearer in your head? Can you feel how your arms and legs are positioned? Does it feel like you are really skating? You are strong and powerful as skate the program. You flow gracefully across the ice.

The team will skate the opening of the program, one last time. This time, I want you to use all your concentration to try to make improvements to the program. Are your arms locked into position? Is your head turning at the same time as the rest of the team. Are you looking up? Are you standing up straight? Try to feel your tummy tighten and your back straighten. Can you stretch your legs a little bit more than usual. Can you point your feet. Add more expression to the program.

Appendix L

Example of an imagery script:

Competitive Setting

Imagery Training ScriptSession #6: Competitive Scene

Remember to follow my instructions as exactly as possible. During this session, try to use only one imagery perspective. In other words, if you indicated to me that you prefer using an outside view, try not switch to an inside view. If you make any switches, then indicate to me at what point you are making this switch during the session, when you fill out the post-session evaluation. Are there any questions before we begin?

Now, get into a comfortable position. Now take THREE, LONG, SLOW breaths through the nose. In order to become completely relaxed, attempt to feel your lungs, your chest, and your stomach fill up with air. Breath out all the air completely through the nose or mouth. *(Let skaters take a moment to this)*

In our previous imagery training sessions, we have been working on different skills from your program, such as the kickline. You have been focusing on making improvements to your body position and presentation. Today, we will be working on this skill, but imaging being at the National Synchronized Championships which will be held at the Civic Center.

One of the reasons that athletes use imagery, is to be able to practice being at a competition many times before ever stepping into the building. For example, before Tara Lipinski won Olympic Gold in Japan, she would rehearse, in her mind, everything that she wanted to happen at the competition, from the locker room to the medal podium. That way, when she was actually at the competition, she was confident since everything was familiar to her. In order to make your imagery as realistic as possible, I will describe

the scene. First, picture yourself dressed in your competition outfit, with your tights on, and your skates done up. Your hair is in a bun, your makeup is on, as well as your earrings.

Now picture yourself standing by the boards of the Civic Center, a few moments before competing. The zamboni is cleaning the ice, and your team will be the first to skate. Look around the arena, notice where the judges are sitting, the people sitting in the stands, the boards are decorated with blue material for the competition, the zamboni driver has a tuxedo on, and music is playing in the background.

Begin to focus on the performance you are about to make. Try to gather all the good feelings you would like to have when competing; such as being self-confident, in control, tough, excited, and having fun.

The team is announced, and an official from the competition opens the door to the ice surface. In the background, the audience begins to clap. One by one the team steps onto the ice, and moves into position for the warm-up block. Take a moment to image the warm-up, up until the starting position of the program. While you image the warm-up block, focus on your posture; bent skating knees, your free leg is extended and pointed, straight/arched back, arms locked into position, and your head held high. Open your eyes when you reach the starting position of the program.

Return to your starting position, this time, the music will play while you image the first section of the program. Focus on giving 100% effort throughout this section while feeling self-confident and in control of your excitement of competing. (*Let skaters take a moment to this*)

Now, try to take your imagery up a notch. This time when you image the first section of the program in competition, focus on having a perfect **leg** position. Try to see and feel better extension of the free leg, your toes pointed, and your skating leg bent.

When you are ready to continue, focus on having a perfect **posture**. Try to see and feel yourself skating with a straight back...., a tight tummy..., skating knee is bent..., shoulders are down..., and shoulder blades pulled together. As well, see yourself skating with your head up.

When you are ready to continue, focus on your **arms**. Your arms should be locked and in position. They should feel strong. If you are on the end of the line, make sure each arm movement is sharp.

Finally, you will focus on the **presentation** of this section. See and feel yourself skating with confidence..., with a smile on your face..., with lot's of energy and pizzazz. You are having lot's of fun.

Appendix M
Information Letter

Dear Skaters,

My name is Jennifer Cumming, and I am a graduate student at the University of Ottawa. Starting January 27, I will be conducting a research project on imagery training with your synchronized skating team. The purpose of this study is to examine the effects of training an internal or external imagery perspective on cognitive and motivational functions of imagery. It is hoped that the findings from this research will provide sport psychology consultants, coaches and skaters with a better understanding of imagery perspective in order to develop more effective imagery training programs. This topic is of great personal interest to me, since I was a competitive figure skater and coach.

If you decide to participate in this study, the following things will be required of you:

1. To complete two questionnaires before and after the training program in order to assess imagery use and ability.
2. To participate in a 5-week training program that will consist of attending 9 imagery training sessions, and completing 1 audio taped imagery exercises. Each training session will involve approximately 15-20 minutes of your time, and will be scheduled so as not to interfere with any on-ice or off-ice training.

Please do not feel obligated to participate in this research project, but if you do decide to become involved, I am sure that it will be a valuable learning experience as well as highly relevant to your training. Enclosed you will find two questionnaires. If you choose to participate in this project, please complete the questionnaires and return them to me on Tuesday, January 27. A schedule of imagery training sessions will be given to you as soon as possible.

This research is being done as part of the requirement of a Masters degree in the field of Human Kinetics under the supervision of Dr. Diane Ste-Marie. If you have any questions or concerns, please call me at 789-2787 or Dr. Ste-Marie at 562-5800 ext. 4255.

Yours sincerely,

Jennifer Cumming

Appendix N

Consent Form

INFORMATION AND CONSENT FORM**Principal Investigators**

Jennifer Cumming
 Graduate Student
 School of Human Kinetics
 University of Ottawa
 Phone Number: 789-2787

Dr. Diane Ste-Marie
 Assistant Professor
 School of Human Kinetics
 University of Ottawa
 Phone Number: 562-5800 ext. 4255

You may also want to contact Dr. Roger Proulx, Chair of the Faculty of Health Sciences Human Research Ethics Committee at the University of Ottawa for information concerning ethical approval of this project which is entitled "The Effects of Training Visual Imagery Perspectives on Imagery Functions". Phone Number: 562-5800 ext. 4251

Purpose: The purpose of this study is to examine the effects of training an internal or external imagery perspectives on cognitive and motivational functions of imagery.

Demands: This research project will involve your daughter's participation in an imagery training program, for a total of ten sessions. Before and after the training program, she will be asked to fill out two questionnaires. Please be aware that if she no longer wishes to continue with this research project, she can inform the researcher, and is welcome to withdraw. Any data collected will be destroyed, and will not be used in the research. There will be no reprisals due to her withdrawal.

Risks/Discomforts: Since the training program will be given off the ice, there are no expected risks for participating in this study. The possible benefits are an improvement in imagery ability which may lead to an improvement in overall skating performance and self-confidence.

Anonymity/Confidentiality: If data is published, it will be presented in a pooled format. In addition, your daughter's name will not be placed on any of the questionnaires or data collection sheets, ensuring anonymity and confidentiality of her results. The data will be stored for a minimum of three years (as per research publication requirements) in a file to which only the principal investigators have access. After this time, the questionnaires will be shredded and the paper recycled!

The experimenter will be willing to answer any questions before, during and after the study that your daughter may have. She will also be given a copy of this information and consent form.

I _____ (please print) have read the above information and voluntarily agree to give permission to my daughter to participate in this research project.

Parent's signature _____ Date: _____

Participant's signature _____ Date: _____

Researcher's signature _____ Date: _____

Appendix O
Ethics Approval



Université d'Ottawa • University of Ottawa

Faculté des sciences de la santé
Cabinet de la doyenne

Faculty of Health Sciences
Office of the Dean

December 2, 1997



Professor Diane Sainte-Marie
Student Jennifer Cumming
School of Human Kinetics
Faculty of Health Sciences
125 University, Montpetit Hall
INTRA

Dear Professor and Student:

Subject: Your project entitled "*The effects of training internal and external imagery perspectives*"

It is my pleasure to inform you that the Faculty of Health Sciences, Human Research Ethics Committee, after study of the documentation provided, concluded that your project met the appropriate standards of ethical acceptability and falls within **CATEGORY 1A**.

I hereby attach a copy of the certificate of clearance granted by the University Human Research Ethics Committee.

This certificate is valid for a period of one year from the time of issuance. I would also like to remind you that, in accordance with the policies of the UHREC, it is your responsibility to notify the Committee of any major changes in this project.

On behalf of the Committee, I wish you success in your project.

Sincerely,

J. Roger Proulx, Ph.D.
Chair, Human Research Ethics Committee

Encl.



Université d'Ottawa - University of Ottawa

Faculté des sciences de la santé
Cabinet de la doyenne

Faculty of Health Sciences
Office of the Dean

CERTIFICATION OF INSTITUTIONAL HUMAN RESEARCH ETHICS COMMITTEE FACULTY OF HEALTH SCIENCES

This is to certify that the Institutional Human Research Ethics Review Committee of the Faculty of Health Sciences has examined the research proposal by **Professor Diane Sainte-Marie and Student Jennifer Cumming** from the School of Human Kinetics, for the project "*The effects of training internal and external imagery perspectives*" and concludes that, in all respects, the proposed research protocol meets the appropriate standards of ethical acceptability, at a **Category 1A** level.

MEMBERS OF THE COMMITTEE

<u>Name (Optional)</u>	<u>Position held</u>	<u>Department of discipline</u>
Victor Boucher	Professor	Audiology and Speech-Pathology Program
François Tremblay	Professor	Physiotherapy Program
Claire-Jehanne Dubouloz	Professor	Occupational Therapy Program
Jocelyne Tourigny	Professor	School of Nursing
Julian Roberts	Professor	Department of Criminology
Roch Paquin	Member-at-Large	
Mark Grenier	Student	School of Human Kinetics
J. Roger Proulx	Chair	Human Research Ethics Committee School of Human Kinetics

SIGNATURE

02/12/97

Date

Committee Chairperson - J. Roger Proulx, Ph.D.