The Cognitive and Motivational Effects of Imagery Training: A Matter of Perspective

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The primary purpose of this study was to use synchronized skaters to examine the influence of imagery perspective on the cognitive and motivational functions of imagery during a five-week imagery training program. To this end, 16 novice synchronized skaters participated in an imagery intervention that incorporated both cognitive and motivational imagery. The Sport Imagery Questionnaire (SIQ; Hall, Mack, Paivio, & Hausenblas, 1998) was used to assess changes in the skaters' use of cognitive and motivational images as a result of the training program. The results of a MANOVA indicated that skaters increased their use of cognitive specific and cognitive general imagery, regardless of their preferred imagery perspective. Furthermore, neither group showed changes in their use of imagery for motivational functions. The findings are discussed within the context of Hardy’s (1997) proposal that a particular imagery perspective is beneficial for the learning and performance of motor skills if it provides visual information that is otherwise not available to the performer.

There are two different perspectives that an athlete can take when performing mental imagery, an external or internal perspective. Mahoney and Avener (1977) define an external imagery perspective as being the person taking the position of an observer, as if watching a film or video of a past performance. An internal imagery perspective, on the other hand, was defined as athletes viewing the images as though they were inside their body and experiencing all those sensations, which might be expected in the actual situation. In an exploratory study on elite gymnasts, gymnasts who qualified for the Olympic team reported using a higher frequency of internal images as compared to external images than did nonqualifying gymnasts (Mahoney & Avener, 1977). Others (e.g., Epstein, 1980; Harris &

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Robinson, 1986; Mumford & Hall, 1985; Orlick, 1990) have also indicated that internal imagery is characteristic of successful athletes 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).

One of the assumptions underlying the recommendation made by these researchers for athletes to adopt an internal imagery perspective was that kinesthetic imagery, the type of imagery that involves experiencing all the same sensations as when performing the actual movement, could only be experienced through an internal perspective. Furthermore, imagery experienced through an external perspective was believed to be only of a visual nature (Barr & Hall, 1992; Epstein, 1980; Hale, 1982; Hall, Rodgers, & Barr, 1990; Mahoney & Avener, 1977). Recent research, however, has provided evidence that athletes are capable of experiencing kinesthetic sensations from either an internal or external perspective (Glisky, Williams, & Kihlstrom, 1996; Gordon, Weinberg, & Jackson, 1994; Hardy & Callow, 1999; White & Hardy, 1995). For this reason, researchers have recommended that imagery perspective be considered the viewpoint that an individual takes during imagery (i.e., first vs. third person) and not necessarily the sensory modality involved (Glisky et al., 1996; Hall, 1997; Hardy, 1997). In addition, it would also be important for research in the area of imagery perspective to ensure that all participants have the ability to image kinesthetically, regardless of their adopted imagery perspective. In doing so, researchers would be assured that any conclusions they made about the benefits of imagery training were not confounded by the participants’ kinesthetic imagery ability.

Another consideration is that the benefits of a particular imagery perspective may be due to the characteristics of the skill being imaged (Glisky et al., 1996; Hardy, 1997; Hardy & Callow, 1999; White & Hardy, 1995). More specifically, Hardy (1997) has suggested that skills depending on technical form (e.g., precise body movements) for their successful completion would benefit most from an external perspective. In comparison, skills depending on perceptual information are well learned, not complex, and do not depend on technical form would benefit more from an internal perspective. For example, White and Hardy (1995) found that participants imaging from an external perspective showed better learning and performance of a task that required participants to perform precise body movements (a gymnastic type routine) as compared to those who had used internal imagery. Conversely, in the same study, participants that had used internal imagery executed a canoe slalom task with fewer mistakes than those who used external imagery.

Based on these previous findings, Hardy (1997) has proposed that “imagery exerts a beneficial effect on the acquisition and performance of a motor skill only to the extent that the generated images supplement the useful information that would otherwise be available to the performer” (p. 289). Accordingly, when performing the gymnastic type routine, participants imaging from an external imagery perspective were able to “see” the precise positions and movements that were required for performing the skill, which is information not normally available to the performer or provided to the performer through an internal visual perspective. Conversely, when performing the canoe slalom task, participants imaging from an internal perspective were provided with perceptual information that was not available through an external perspective.
Other studies have since replicated White and Hardy’s (1995) findings that external imagery is more beneficial than internal imagery for skills that require precise body positions with a karate task (Experiment 1; Hardy & Callow, 1999), a gymnastics task (Experiment 2; Hardy & Callow, 1999), and a rock-climbing task (Experiment 3; Hardy & Callow, 1999). As a result, Hardy and Callow have recommended that athletes should consider the characteristics of the skill being imaged in selecting the imagery perspective that will most benefit performance. However, this recommendation does not consider the use of imagery for motivational purposes even though it has been suggested that internal and external imagery perspectives may exert qualitatively different motivational influences (Hall, 1997; Hardy, 1997; White & Hardy, 1995). Furthermore, it would be important to examine whether these differences do occur because motivational imagery has been shown to be just as important as cognitive imagery in athletic performance (Hall, Mack, Paivio, & Hausenblas, 1998; Martin & Hall, 1995; Moritz, Hall, Martin, & Vadocz, 1996; Vadocz, Hall, & Moritz, 1997).

It was Paivio (1985) who first proposed that imagery has both cognitive and motivational functions, with each operating at a general or specific level. The cognitive functions involve the rehearsal of specific sport skills (CS; cognitive specific imagery) or general strategies or routines (CG; cognitive general imagery). The motivational function involves imaging specific goals and the activities necessary for achieving those goals (MS; motivational specific imagery) or imagery related to general physiological arousal and affect (MG; motivational general imagery). Hall et al. (1998) identified that motivational general imagery should be further subdivided into two specific components. Motivational general-arousal imagery (MG-A) is associated with arousal and stress, and motivational general-mastery imagery (MG-M) is associated with being in control, mentally tough, and self-confident.

In summary, research has shown that when athletes use cognitive imagery to enhance skill learning, imagery perspective is an important variable to consider. Furthermore, while imagery has both cognitive and motivational functions, the influence of imagery perspective on motivational imagery use has not been examined. Therefore, the first purpose of this study was to examine the influence of imagery perspective on the cognitive and motivational functions of imagery during a five-week imagery training program with synchronized skaters. We chose to include synchronized skaters because this sport depends on technical form and precise movements to execute the necessary skills. In doing so, we would be able to make comparisons to previous research conducted on a similar task (e.g., White & Hardy, 1995). Our hypothesis was that skaters using an external, but not an internal imagery perspective would increase their use of cognitive specific imagery. We made this prediction based on Hardy’s (1997) proposal that skaters using an external imagery perspective would be provided with visual information on technical form and body positions that would not otherwise be available to the performer or available when imaging from an internal perspective. Therefore, skaters using an external perspective would be better able to image such skills perfectly or change the image of the skill, both of which are examples of cognitive specific imagery. Furthermore, we wanted to extend research on imagery perspective by examining its influence on the cognitive general and motivational functions of imagery. As this study was exploratory in nature, and no theoretical justification could be found, no hypotheses were made as to how imagery perspective would influence these functions.
A second purpose involved examining whether changes would occur in imagery ability as a function of the imagery training program. Rodgers, Hall, and Buckolz (1991) demonstrated that a 16-week imagery training program improved imagery ability as measured by a test-retest on the Movement Imagery Questionnaire (MIQ; Hall & Pongrac, 1983). They suggested that further research was necessary in order to better understand the length of the training program needed to bring about improvements in imagery ability, as well as how these changes might be manifested (i.e., changes in visual versus kinesthetic imagery). Since we used the MIQ at the beginning of the study as a measure to ensure that the groups were equal in imagery ability, a factor known to influence whether benefits occur with imagery use (e.g., Murphy, 1994), it was also administered at the end of our training program in order to test whether a short-term training program could improve imagery ability. We hypothesized that both visual and kinesthetic imagery ability would improve with practice regardless of the skaters’ imagery perspective given that previous research has shown that athletes are capable of experiencing kinesthetic sensations from either an internal or external perspective (Glisky et al., 1996; Gordon et al., 1994; Hardy & Callow, 1999; White & Hardy, 1995).

Method

Participants

Eighteen, female, novice level synchronized figure skaters (age range = 10–15 years; $M = 13.03$ years) from a single team were recruited to participate in this study from the Ottawa region. As defined by Skate Canada (2000), the governing body for figure skating in Canada, skaters are eligible to compete at the novice level if they have passed their Junior Bronze free skate test, Junior Bronze dance test, or their Skating Skills Class 6 test and have not yet reached the age of 15 by July 1 of that competitive year.

Following the first imagery session, the skaters identified their preferred perspective (i.e., internal or external) to the primary researcher. The skaters were then encouraged to image from their preferred imagery perspective throughout the imagery training program (Glisky et al., 1996). Furthermore, skaters who did not consistently maintain their preferred imagery perspective were excluded from the study. 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, their data was not included in the analysis. The end result was that eight skaters had consistently adopted an external perspective, and another eight skaters did so for the internal perspective. Additionally, skaters were screened prior to the start of the study with the Movement Imagery Questionnaire (Hall & Pongrac, 1983) to ensure that they did not significantly differ in visual and kinesthetic imagery ability.

Instruments

Imagery Ability. The Movement Imagery Questionnaire (MIQ; Hall & Pongrac, 1983) was used as a participant-screening device because it measures both visual and kinesthetic imagery ability. This questionnaire asked the skaters to perform 18 different imagery tasks, with nine of these tasks assessing visual imagery ability and the remaining nine tasks assessed kinesthetic imagery ability. The skaters were then asked to rate the ease/difficulty with which they are able to do
these tasks on a 7-point rating scale (1 = very easy to picture/feel and 7 = very hard to picture/feel). The nine scores for each subscale were then added together to achieve a total score for visual and kinesthetic imagery ability, with a possible range of scores being 9–63. The MIQ is scored in such a manner that a low score indicates a higher ability. Atienza, Balaguer, and Garcia-Merita (1994) provided support for the bifactorial structure of the MIQ by finding that all of the visual items loaded on one factor and all of the kinesthetic items loaded on a second factor. In addition, the reliability of the MIQ has been shown to be acceptable with the test-retest coefficient being .83 following a 1-week interval (Hall, Pongrac, & Buckolz, 1985). Internal consistencies reported in the imagery literature have ranged from .87–.89 for the visual subscale and .88–.91 for the kinesthetic subscale (Atienza, et al., 1994; Hall et al., 1985). Similar internal consistencies were found for the present study (visual subscale = .88; kinesthetic subscale = .81).

**Imagery Function.** 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 asked the skaters to rate on a 7-point scale (1 = rarely and 7 = often) how often they utilize 5 different types of images: cognitive general imagery (CG), cognitive specific imagery (CS), motivation general-mastery imagery (MG-M), motivation general-arousal imagery (MG-A), and motivation specific imagery (MS). The 6 items that correspond to each subscale were then averaged to achieve a score that indicated to what extent the skaters used each of the functions of imagery, with a possible range of scores being 1 to 7. Hall et al. (1998) reported that all items loaded on their appropriate factor above the criterion level (.40) and all subscales had an acceptable internal consistency (alpha coefficients of above .70). Analysis of the present study indicated adequate internal consistencies with alpha values ranging from .75 to .91.

**Post-Session Evaluation.** Following each imagery session, the skaters were asked to rate their use of a particular imagery perspective on an eleven-point Likert scale (0 = completely internal perspective, 10 = completely external perspective). The skaters were instructed that a value of 2 would indicate that the skaters had experienced very minimal switching to an external perspective. In comparison, a value of 8 would indicate that the skaters had experienced very minimal switching to an internal perspective. As well, the skaters were asked to rate the ease/difficulty of achieving their visual and kinesthetic images of the specific synchronized skating skills that were mentally imaged in that training session by using the same 7-point rating scale used in the MIQ (1 = very easy and 7 = very hard). This measure is later referred to as the skating-specific measure of imagery ability.

**Procedure**

Prior to the start of the imagery training program, a meeting was held with the primary researcher and 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 per week for five weeks, which produced an imagery training program similar in length
to that employed by Hardy and Callow (Experiment 1; 1999). 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 to use a brief exercise to become more focused (e.g., breathing) at the start of each session (Orlick, 1990; Rushall & Lippman, 1998). Each session consisted of the primary researcher reading an imagery script to the skaters as a group. 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 as well as image the correct form.

The main emphasis of each session was imaging the five different functions of imagery. Cognitive specific imagery involved the skaters imagining the technical form and precise body positions required to perform different synchronized skating skills. For example, the skaters were asked to image themselves skating a skill while keeping their head held high, arms locked into position, skating knee bent, free leg extended and pointed, and maintaining a good posture. In a similar fashion, cognitive general imagery involved the skaters imaging the technical form and precise body positions required to skate their program and sections of their program perfectly.

In addition to the cognitive functions, the scripts also focused on the motivational functions of imagery. Motivational specific imagery involved the skaters imaging their team goals. For example, the skaters were asked to image themselves qualifying for the National Championships. Motivational general-arousal imagery involved the skaters imaging the energy and excitement of performing their program in practice and competition. For example, the skaters were asked to image themselves successfully coping with the stress and excitement of competing at the National championships. Finally, motivational general-mastery imagery involved the skaters imaging staying focused, building or maintaining their self-confidence, and staying positive. An example of this type of imagery was asking the skaters to image themselves successfully recovering from making a mistake in the routine by staying focused and in control of their emotions.

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 questions, it was first necessary to ensure that the participants had maintained their use of a particular imagery perspective throughout the training program. Also, it was necessary to ensure that all participants had similar levels of imagery ability, 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 mediating factors, such as participants switching their imagery perspective or different levels of imagery ability.

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 instructed that values of 0–2 on the 11-point Likert scale 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 experienced very minimal switching to an internal perspective. Skaters reporting using an external perspective (M = 9.3, SD = .04) scored higher than those skaters who reported using an internal perspective (M = 1.9, SD = 1.53), which was expected due to the nature of the one-dimensional rating scale. A repeated measures analysis of these scores indicated that this difference between the groups was significant, and this difference increased over the duration of the training program, F(9, 126) = 6.73, p < .01. Therefore, we concluded that the skaters were indeed maintaining their preferred perspective.

To examine whether any group differences occurred prior to the start of the intervention, a MANOVA was conducted with imagery perspective serving as the independent variable, and the MIQ (i.e., visual and kinesthetic) and SIQ subscales (i.e., CS, CG, MS, MG-A, and MG-M) serving as dependent variables. No significant multivariate effect was found, Pillai's Trace = .474, F(7, 8) = 1.03, p > .05, indicating that the groups had similar levels of imagery ability and imagery use.

**Primary Analysis**

The means and standard deviations for the SIQ subscales (i.e., CS, CG, MS, MG-A, and MG-M) and MIQ subscales (i.e., visual and kinesthetic) are presented in Table 1. To assess the skaters' imagery use (i.e., the SIQ subscales) and imagery ability (i.e., the MIQ subscales) prior to and following the intervention program, a MANOVA was conducted (Kirk, 1995). The independent variables were the skaters grouped by imagery perspective (i.e., internal or external) and time (i.e. pre- and post-intervention). There proved to be no significant multivariate effect of group, Pillai's Trace = .501, F(7, 8) = 1.146, p > .05. There was, however, a significant multivariate effect of time, Pillai's Trace = .804, F(7, 8) = 4.699, p = .02, η² = .80, with the observed power being 82.5%. No significant group by time interaction was found, Pillai's Trace = .617, F(7, 8) = 1.839, p > .05.

Using a bonferroni correction to control for Type 1 error when using multiple comparisons (adjusted alpha level = .049), the only significant univariate effects of time were for the cognitive specific, F(1, 14) = 4.74, p = .05, η² = .25, and the cognitive general subscales, F(1, 14) = 6.99, p = .019, η² = .33, indicating that all skaters significantly increased their use of both of these types of imagery as a result of the training program. The observed power was 52.7% for the cognitive specific subscale and 69.2% for the cognitive general subscale. No significant univariate effects of time were found for the motivational subscales of the SIQ or the visual and kinesthetic subscales of the MIQ.

These results indicate that the skaters did not significantly improve their imagery ability over the course of the training program as measured by the MIQ. However, somewhat different results were found when examining the skaters' scores
Table 1  SIQ\(^{a}\) and MIQ\(^{b}\) Scores for Pre- and Post-Imagery Training Program

<table>
<thead>
<tr>
<th>Training group</th>
<th>Pre-test</th>
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<th>Post-test</th>
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<td>(M)</td>
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<tr>
<td>Cognitive Specific</td>
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<td>External</td>
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<td>5.9</td>
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<tr>
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<td>0.91</td>
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<td>5.35</td>
<td>1.43</td>
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<td>Internal</td>
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<td>4.96</td>
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<tr>
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<tr>
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<tr>
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<td>8.36</td>
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<td>17.63</td>
<td>9.29</td>
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Note. \(a\) SIQ scores are reported as means for the 6 items on each sub-scale. A higher score indicates greater imagery use; \(b\); a lower score indicates a higher ability.

on the more skating-specific measure of imagery ability. Using group (i.e., internal or external) and session (10 imagery training sessions) as the independent variables, ANOVA revealed no group effect, but a significant main effect of time for the visual imagery scale, \(F(9, 126) = 8.369, p = .00, \eta^2 = .37\), with the observed power being 100%. A Tukey HSD post hoc test revealed that significant improvements occurred on the visual imagery scores between the first session \((M = 2.94, SD = 1.12)\) and the fourth session \((M = 2.06, SD = 1.00)\). No significant group by time interaction was found for the visual scale.

A significant main effect of session was also found when using the same analysis on the skating-specific measure of kinesthetic ability, \(F(9, 126) = 5.01, p = .00, \eta^2 = .26\), with the observed power being 99.9%. A Tukey HSD post hoc test indicated that the skaters significantly improved their kinesthetic imagery between the first session \((M = 3.13, SD = 1.36)\) and the eighth session \((M = 2.19, SD = 1.38)\). Again, no significant group effect or group by time interaction was found for the kinesthetic subscale.
Discussion

The purpose of this study was two-fold. The first purpose of this study was to examine the influence of imagery perspective on the cognitive and motivational functions of imagery when controlling for the characteristics of the skill. A secondary purpose was to determine whether imagery ability could improve as a result of a five-week training program.

We were unable to find support for our hypothesis that external imagery would be more beneficial than internal imagery on synchronized skating skills that emphasized technical form and precise body positions by demonstrating that only skaters using an external perspective would increase their use of cognitive specific imagery. What we did find was that skaters, regardless of their imagery perspective, increased their use of both cognitive specific and cognitive general imagery. One explanation for our lack of support for the hypothesis can be developed from Whiting and den Brinker's (1981) suggestion that an external imagery perspective is superior to internal imagery for performance when the performer is relatively inexperienced with the task, or more specifically, when the performer is attempting to understand the general shape of the movement or the "image of the act." However, as the performer becomes more experienced with the task, the benefits of using an external imagery perspective may disappear because the performer is now using imagery to form a template of the precise muscular forces needed to perform a movement or an "image of achievement."

The suggestion has been that an external imagery perspective enhances the "image of the act" but not the "image of achievement" (Hardy & Callow, 1999). For example, Hardy and Callow (1999) found that an external imagery perspective was superior to internal imagery when the performer was learning a task that emphasized good form. In comparison, the skaters in our study were all quite experienced with the task because the intervention was held during the final weeks of their competitive season, and the skaters had been practicing their skills for several months prior to this point. It is possible that external imagery did not contribute any additional benefits to the skaters for imaging cognitive specific and cognitive general imagery over using an internal perspective because the skaters were forming the "image of achievement." It would, therefore, be important for future research in the area of imagery perspective to consider the experience level of the individual with the task in order to clarify issues regarding the "image of the act" and the "image of achievement."

A second explanation for our lack of support for the hypothesis is that unlike the tasks performed in laboratory settings (e.g., Hardy & Callow, 1999; White & Hardy, 1985), the synchronized skating skills performed in the present study were in a "real-world" setting. It is possible that the setting used in the present study may have unintentionally allowed for a combination of the requirement for good technical form with a perceptual requirement for responding to external information. In this situation, it is possible that the skaters were attending to the visual cues that provide more information to them. For example, an external perspective would provide information concerning the placement of arms, legs, and head of the skater in relation to the formation of the rest of the team. The skater could then use this information to make mental corrections to the skill and/or to image the precise positions needed to be synchronized with the rest of the team.

Conversely, skaters using an internal imagery perspective would likely see their own front arm placement and that of the person immediately in front of them,
but no information about what was behind them. However, the dominant information for skaters imaging from an internal perspective might be the perceptual information they receive on spatial locations and the timing at which key movements should be initiated (Hardy & Callow, 1999). More specifically, an internal imagery perspective might help skaters to respond to external cues that help them to change patterns and alignments. Therefore, it is possible that skaters using an internal imagery perspective also benefited from the training, but it would be impossible to determine what type of visual information the skaters were attending to without examining performance (e.g., better timing versus better technical form). Future research would therefore be needed to clarify these issues.

When examining the skaters' use of imagery for motivational functions, we were unable to find any significant increases following the intervention program. This may be due to length of the training program not being long enough to produce any changes in motivational imagery use. In comparison, Rodgers et al. (1991) found changes in motivational imagery to occur following a 16-week intervention. We also found that imagery perspective did not influence the skaters' use of motivational imagery. This finding is similar to Hardy and Callow (1999), who found no beneficial effects for using a particular imagery perspective in enhancing self-confidence (e.g., MG-M imagery).

Contrary to Rodgers et al. (1991), the intervention did not result in significant improvements in the skaters' imagery ability as measured by the MIQ. We did find, however, that the skaters improved both their kinesthetic and visual imagery ability when examining a more skating-specific measure. This finding corresponds well to Paivio's (1985) contention that "there is no single best measure of imagery ability because imagery skills are at least as varied as verbal skills, and the trick is to find one that is most directly related to the specific task under consideration" (p. 275).

When examining how changes occurred in imagery ability, it appeared that the skaters improved visual imagery first and improved their kinesthetic imagery later during the imagery training program. Rodgers et al. (1991) 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 their sixteen-week training program. A cognitive theories explanation of these findings would be that performers rely largely on visual cues during the early stages of learning (Fitts, 1964) and make use of kinesthetic cues in the later stages (Fleishman & Rich, 1963). Furthermore, Rodgers et al. postulate that these findings might 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, 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.

One limitation that can be identified in the present study was that the small sample size. However, the effect sizes were all moderate in magnitude, and the power was generally acceptable. Several strengths can also be identified from this study. First, we followed suggestions made by previous researchers to use manipulation checks to ensure that the skaters did not switch imagery perspectives throughout the intervention and to encourage the skaters to image from their preferred perspective (Glinsky et al., 1996). In doing so, we were able to resolve a limitation in previous research that assigned athletes to image from a particular
perspective, which led to the possibility of the athletes switching back to their preferred perspective without the researchers being aware of it (e.g., Epstein, 1980; Harris, & Robinson, 1986). Also, the present study included a manipulation check to ascertain the ability to of the skaters to image kinesthetically. Moreover, we actively encouraged the skaters to include kinesthetic sensations regardless of the actual perspective that they adopted. In doing so, we were able to conclude that the benefits of the imagery training program were not confounded by kinesthetic imagery being used through one imagery perspective and not the other.

**Implications for Sport Psychologists**

Numerous studies have shown that imagery is an important skill for athletes (for a review, see Hall, 2001). Knowing this, it becomes important to determine how imagery would be optimally incorporated into one’s training and competitive cycle. The results of this study indicate that an imagery training program can increase an athlete’s use of the cognitive functions of imagery. This is an important finding given that cognitive imagery has already been shown to predict competitive performance (Hall et al., 1998) for athletes of a similar competitive level to those in the present study.

Imagery perspective does not seem to influence athletes’ use of either the cognitive or motivational functions of imagery, which was demonstrated in the present study by the lack of group differences prior to or following the intervention. Furthermore, the results of the present study suggest that when sport psychologists and coaches perform a task analysis of the different skills included in a particular sport, they should consider both the athlete’s experience with the skill and whether the skill combines different task demands (i.e., technical form, perceptual information) in recommending an optimal imagery perspective. Moreover, it is important to consider the athlete’s preference for a particular perspective, because as suggested 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).

In addressing imagery ability, two recommendations can be made. First, athletes have the ability to use kinesthetic imagery from an external perspective to the same extent as an internal perspective. Therefore, coaches and sport psychologists should encourage athletes to incorporate kinesthetic sensations into their imagery, regardless of which perspective they use, in order to feel the desired movements. Second, athletes improve their ability to perform sport-specific images over a relatively short period of training (i.e., five weeks). This is an important finding because high imagery ability has been linked to better learning and performance of motor skills (Goss, Hall, Buckolz, & Fishbourne, 1986). As a result, it would beneficial for the athlete to attempt to develop their imagery ability, even if only the final weeks of a season are remaining.

**References**


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