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The Influence of an Imagery Workshop on Athletes' Use of Imagery

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Abstract

The purpose of the study was to examine the influence of a mental imagery workshop on athletes' subsequent use of imagery. The participants were 36 female basketball players from three different levels of a high school basketball league: bantam, midget, and juvenile. Two different types of self-report measures were used to assess patterns of imagery use over a six week period following the workshop. The Sport Imagery Questionnaire (SIQ; Hall, Mack, Paivio, & Hausenblas, 1998) was given to the players prior to the start of the workshop, and three and six weeks following the workshop. The players also recorded the frequency, duration, content, and effectiveness of their imagery use in a training diary. Results revealed that the basketball players significantly increased their imagery use for the 6-week period following the workshop, and that the basketball players believed the imagery training to be both valuable and effective.

Introduction

Psychological skills have long been considered an integral part of what makes an athlete successful at elite levels. Perhaps one of the most widely researched and popular intervention strategies to date has been the use of mental imagery, which has been defined as a psychological activity that evokes physical characteristics of any object, person, or place that is absent from our perception (Denis, 1985). White and Hardy

(1998) suggest that through imagery “we can be aware of ‘seeing’ an image, feeling movements as an image, or experiencing an image of smell, taste or sounds without experiencing the real thing” (p. 389). Furthermore, they distinguish imagery from dreaming because “we are awake and conscious when we form an image” (p. 389). Meta analyses examining the influence of imagery training on performance have found moderate effect sizes ranging from .48 (Feltz & Landers, 1983) to .68 (Hinshaw, 1991). These findings have led researchers to conclude that in comparison to no practice at all, imagery usually benefits performance (Durand, Hall, & Haslam, 1997). As a result, Hall (2001) has suggested that imagery can serve as an effective supplement to regular physical practice and as a substitute for some amounts of physical practice when athletes are unable to train.

In order to maximize the performance benefits derived from imagery training, researchers have turned to athletes as a valuable source of information on imagery use (for reviews, see Hall, 2001; Martin, Moritz, & Hall, 1999; Murphy & Martin, 2002). Key findings that have emerged from these studies can be organized into different categories known as the four W’s of imagery use; (1) where athletes use imagery (i.e., location), (2) when they use imagery (i.e., time frame), (3) what they image (i.e., content), and (4) why they image (i.e., function of imagery) (Munroe, Giacobbi, Hall, & Weinberg, 2000). In sum, the research has found that athletes use imagery predominately at training and competition venues, as well as in a variety of locations such as school, work, and home. Athletes consistently report using imagery the most just prior to competing, as compared to during or after the competition, and the most during training sessions as compared to just prior to or following a training session. With respect to the content of their imagery (i.e., what they image), their imagery is generally accurate and vivid, and tends to be positive rather than negative in nature. Athletes report that their imagery incorporates different sensory experiences (i.e., visual, kinesthetic, and sometimes auditory and olfactory information), and they use both internal (first person) and external (third person) imagery perspectives to view the images. Furthermore, athletes tend to not only image the skills and strategies they perform in their sport, but also image other details such as the surroundings in which they are going to compete (e.g., competition venue, officials, teammates, and opposing players).

To explain the functions that imagery can serve in sport (i.e., why athletes use imagery), Paivio (1985) developed a simple analytical framework of imagery use. Within this framework, imagery is thought to serve both cognitive and motivational functions, and that each operate at either a specific or general level. The cognitive function of imagery revolves around imaging sport skills (e.g., cognitive specific imagery) or imaging game plans and strategies (e.g., cognitive general). While controlled studies have demonstrated that cognitive specific imagery it is an effective technique for enhancing learning and performance (see Driskell, Copper, & Moran, 1994; Hall, Schmidt, Durand, & Buckolz, 1994 for reviews), case study reports support the performance benefits of cognitive general imagery (Fenker & Lambiotte, 1987; Mace, Eastman, & Carroll, 1987; MacIntyre & Moran, 1996; Rushall, 1988; White & Hardy, 1998). In comparison, the motivational functions of imagery revolve around imaging the achievement of goals (e.g., motivational specific), imaging the regulation of anxiety and arousal levels (e.g.,

motivational general-arousal), and imaging mastery situations (e.g., motivational general-mastery). The motivational functions have also been linked to performance benefits by demonstrating increased motivation in athletes (Callow & Hardy, 2001), improved regulation of arousal (Hecker & Kaczor, 1988) and anxiety levels (Vadocz, Hall, & Moritz, 1997), as well as the enhanced capability to modify cognitions such as self-efficacy (Feltz & Riessinger, 1990) and self-confidence (Callow, Hardy, & Hall, 2001).

Along with understanding how athletes can use psychological skills, such as imagery, more effectively, there has also been the acknowledgement in the sport psychology literature for the need to learn and practice these skills (Harris & Harris, 1984; Weinberg & Williams, 2001). Weinberg and Williams (2001) have suggested that psychological skills are developed in a similar manner to physical skills in that positive effects occur after extensive practice and application. Furthermore, Hall (2001) has suggested that imagery for the rehearsal of skills (i.e., cognitive specific) should be treated in a similar fashion to physical practice. Research examining imagery use, however, suggests that many athletes do not approach imagery practice in the same structured (i.e., plan duration and topics to be imaged) and regular (i.e., at a specific time each day) fashion that they approach physical practice (Barr & Hall, 1992; Hall, Rodgers, & Barr, 1990; Rodgers, Hall, & Buckolz, 1991). In a systematic comparison of imagery use across different sports, Hall et al. (1990) found that athletes varied their imagery use throughout the year, and imagery sessions were not always structured, regular or of the same duration. Elite athletes, however, reported more structured imagery sessions than their non-elite counterparts. Similarly, Cumming and Hall (2002a) found that non-elite athletes perceived imagery as being less relevant to their competitive performance and practiced imagery much less than more elite athletes. Rodgers et al. (1991) found that adolescent figure skaters did not structure their imagery practice as they would their physical practice, and failed to practice imagery on a regular basis. Furthermore, the skaters believed that imagery had some value, but they didn't regard imagery as a skill worthy of practice on its own, or were unaware of how to best develop and use their imagery skills. Finally, Bull (1991) reported that athletes who chose not to participate in a psychological skills training program perceived these skills to be of little benefit to them. These findings suggest a need for education and training aimed at teaching athletes, especially developing ones, the values and benefits of using mental imagery. In addition, these athletes need to be shown how they may incorporate imagery more effectively into their training programs, with the ultimate goal being for them to use imagery in a more structured and regular fashion, and maximize their potential for performance benefits.

To this end, recommendations have been made regarding the delivery of a psychological skills training program to help athletes more effectively adopt and adhere to the training program. For example, Bull (1991) identified several barriers that prevented athletes from adhering to a psychological skills training program, which included lack of time, a need for an individualized package, and a disruptive home environment. Identification of these barriers led to the suggestion that athletes be provided with a program that was individualized in terms of content. Furthermore, adherence-related strategies should be offered, such as advice on time management, how

to structure and schedule psychological skills training, and how to integrate psychological skills into existing training programs (Shambrook & Bull, 1999).

Practitioners, however, must not just provide suggestions on adherence-related strategies, but also examine the success of these strategies by measuring the athletes' actual adherence to the sport psychology service. As noted by Gould, Petlichkoff, Hodge, and Simons (1990), "too often sport psychologists have blindly assumed that the educational or clinical services offered are successful" (p. 250). But research has reported poor rates of adherence, even to relatively short mental skills training programs (e.g., Bull, 1991; Gould et al., 1990). For example, Gould et al. (1990) assessed the impact of a psychological skill workshop delivered to wrestlers, and found attrition rates of 20% and 25% for the two samples reported within their study. In another study, Bull (1991) provided varsity athletes with eight training sessions over a four-week period, and then measured their adherence to the training program for eight weeks. A mental training diary was used as a self-report measure of adherence, and revealed that athletes had a relatively poor adherence rate, and even those participants who were "high" adherers only managed modest amounts of psychological training. In addition, athletes who were more likely to adhere to the training program had higher sport motivation, and were in an earlier stage of their careers.

Employing the knowledge we have of imagery use and the recommendations advanced by Shambrook and Bull (1999) regarding the delivery of a psychological skills training program, it is now more possible than ever to design imagery training programs tailored to meet the individual needs of developing athletes. Various approaches can be employed to teach athletes how to use psychological skills. One common approach when dealing with a number of athletes (e.g., a team) is to deliver a workshop (Bull, 1991; Brewer & Shillinglaw, 1992; Gould et al., 1990). But, how effective is a workshop for teaching athletes the values and benefits of using mental imagery, as well as showing them how to use imagery more effectively? We attempted to examine this question in the present study while adopting the recommendations made for providing athletes with a program individualized in terms of content and adherence-related strategies. Therefore, the purpose of this study was to investigate the influence of an imagery workshop on athletes' subsequent use of imagery. It was hypothesized that the workshop would lead to an overall increase in imagery use, and more structured and regular imagery practice.

Method

Participants

The participants were all recruited from a female-only high school located in Montreal, Canada. This school was chosen because it had a large basketball program that consisted of three different teams representing varying ability levels. In addition, the school's administration and staff were supportive of the project and gave permission for practice time being allocated for the imagery workshop. Students ($n = 36$) who volunteered to participate in the study played on one of the three basketball teams representing their high school in the Greater Montreal Athletic Association league

(GMAA). The teams competed in the GMAA at one of three possible levels: bantam ($n = 14$), midget ($n = 11$), and juvenile ($n = 11$), with bantam level players being the lowest competitive level, and juvenile level players being the highest competitive level. Bantam level basketball players had an average age of 12.93 years ($SD = .73$) and had been participating on the team for one to two seasons. Midget level basketball players had an average age of 14.64 years ($SD = .51$), and had been participating in the school's basketball program for two to three seasons with all players having previously played for the bantam team. Finally, juvenile level basketball players had an average age of 16.08 years ($SD = .49$), and had been participating in the school's basketball program for four to five years, with all players but two having played for both the bantam and midget teams.

Instruments

Demographics. The basketball players supplied relevant demographic data including age, gender, and competitive level.

Sport Imagery Questionnaire. The Sport Imagery Questionnaire (SIQ; Hall, Mack, Paivio, & Hausenblas, 1998) was used to assess to what extent the basketball players used the different functions of imagery. The SIQ is a 30-item self-report questionnaire that asks the players to rate on a seven point scale (1= rarely and 7= often) how often they utilize the five functions of imagery: 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 six items that correspond to each subscale were then averaged to achieve a score that indicated to what extent the basketball players used each of the functions of imagery, with a possible range of scores being one to seven. Hall et al. (1998) have reported satisfactory psychometric properties for the SIQ and that all subscales demonstrate an acceptable internal consistency with all alpha coefficients above .70. Together, these results suggest that the SIQ is a valid and reliable instrument. Although, the questionnaire was originally validated on an adult sample, it has also been successfully employed with children as young as 10 (Cumming & Ste-Marie, 2001).

Imagery Diary. The imagery diary was used as a self-report measure of imagery use over a six-week period. On each sheet of the diary, the basketball players were asked to record information pertaining to the date, time, location, and duration of their imagery sessions for a specific week. They were also asked to briefly describe the content of each imagery session, and to rate the effectiveness that session on an eleven-point Likert scale (0 = not at all effective, 5 = somewhat effective, and 10 = very effective). Operational definitions were provided to the players to clarify the anchors of the Likert scale. For example, 'not at all effective' was defined as being unable to form clear images and/or experience feelings associated with those images, and 'very effective' was defined as having very clear images and/or very strong feelings associated with those images.

Post-intervention Questionnaire. At the conclusion of the study, the basketball players were asked to respond to several open-ended questions pertaining to mental

imagery (see appendix). In the first section of the questionnaire, the players were asked if their basketball performance had improved as a result of the imagery training, and to describe what these improvements were. In the second part of the questionnaire, the players were asked to describe any difficulties that they may have encountered when they were performing mental imagery. In the third and final part of the questionnaire, the players were asked if they were planning on using mental imagery during the off-season for basketball. If they responded by saying yes, the players were then asked to describe how they planned to use imagery in the off-season, and if they responded by saying no, they were asked to comment on why they would not.

Procedure

Prior to the start of the research study, a letter was sent home for the players and parents to read that described the nature of the study, and the extent to which their participation was requested. Informed consent was also obtained at this time.

During a scheduled practice, the basketball players were asked to complete the SIQ for the first time. A researcher was available to provide clarification and answer questions as necessary. After all the players on the team had completed the questionnaire, they participated in the workshop on mental imagery, and this lasted for approximately 60 minutes. Separate workshops were given to each team, however, the each workshop was delivered by the same person and the content remained consistent upon each delivery.

The workshop began by first providing the players with a definition of mental imagery, and describing the potential value and benefit of using imagery on performance. Basic exercises, such as “arm as an iron bar” (see Vealey & Greenleaf, 2001 for a description), were employed to help illustrate to the basketball players how imagery works. The main part of the workshop was then organized into four categories: (1) where you can use imagery; (2) when you can use imagery; (3) what can you image; and (4) how you should use imagery. In the “where” section, the players were given suggestions as to where they could use imagery based on the common locations reported in the imagery literature. In the “when” section, the players were given suggestions for adherence-related strategies on time management, as well as how they could easily integrate imagery into their existing training program (e.g., before, during and/or after practice and games) and other times during the day. In the “what” section, information was provided about the five different types of imagery. The players were taught that cognitive specific imagery could be used to learn or perfect different basketball skills, such as dribbling, foul shots, and lay-ups, and that cognitive general imagery could be used for learning and perfecting different strategies of play, such as man-on-man defense. The players were also taught that imagery could be used to help them stay motivated by imaging their short and long term goals (motivational specific imagery), to help regulate their energy and anxiety levels by imaging the energy and excitement of performing in practice and game situations (motivational general-arousal imagery), and to help them become more confident, focused, and mentally tough by imaging themselves successfully dealing with difficult situations (motivational general-mastery). In this section, the players were encouraged to individualize the content of their imagery use by imaging

weak aspects of their playing (e.g., technical skills, psychological weaknesses), as well as reinforcing what they had learned or corrected during a particular practice and/or game. In the “what” section, suggestions were made to the players on how they could make their imagery use more effective. The players were encouraged to incorporate all their senses when imaging, especially visual and kinesthetic, and to image playing basketball in both practice and game settings. The final component of the workshop was to teach the players how to complete the imagery diary and provide them with general guidelines for how much time they should spend time using imagery over the following six weeks. Because research has yet to establish optimal patterns of imagery use, no specific targets were set for the frequency and amount of imagery to be performed by the players during the six-week period. Instead we adopted Orlick’s (1990) recommendation, and encouraged the players to establish a regular routine of imagery use by starting with short imagery sessions that were high in quality, and then gradually increase the frequency and duration of these sessions.

To help the players follow the information more easily and to provide them with a reference for their later use, the players were given a package of information at the start of the workshop that outlined the content that would be presented to them. Throughout the workshop, the players were encouraged to actively participate by providing their own suggestions as to what they might image, and to record their ideas in the space provided on their planning sheet. A number of these exercises were performed throughout the workshop. For example, the players were asked to list different skills and strategies that their team had been working on during the season. The players were provided with the ample opportunity to ask questions and receive clarifications when necessary.

The players were instructed to complete the diary at the same time every day (e.g., immediately following practice) by recalling the imagery that they performed that day. To ensure adherence to completing the diaries, the players were reminded before each practice and game that their imagery use was to be recorded on the weekly diary sheets that were returned to the researcher at the end of each week. The SIQ was again completed at three and six weeks following the imagery workshop, and the basketball players were asked to only consider their use of imagery that occurred between in the three week period prior to each SIQ administrations. Once the SIQ was completed for a third, and final time, the basketball players completed the post-intervention questionnaire.

Results

Descriptive Statistics

Means and standard deviations were calculated for each subscale of the SIQ (i.e., cognitive general, cognitive specific, motivational general-mastery, motivational general-arousal, and motivational specific), and are presented in Table 1 by competitive level and time. In general, participants reported using motivational general-mastery imagery the

most frequently, followed respectively by motivational general-arousal imagery, motivational specific imagery, cognitive specific imagery, and cognitive general imagery.

Table 1. Means and standard deviations for the subscales of the SIQ by competitive level and time.

Measure	Time 1		Time 2		Time 3	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Cognitive Specific						
Bantam	3.64	1.45	4.30	1.22	3.94	1.26
Midget	4.55	.79	4.35	1.07	4.74	1.01
Juvenile	4.62	.71	4.64	.78	4.79	1.18
Cognitive General						
Bantam	3.32	.79	3.72	1.04	3.82	.87
Midget	4.24	.67	4.42	.87	4.86	1.04
Juvenile	4.30	.92	4.80	.96	4.97	1.10
Motivational Specific						
Bantam	3.88	1.17	4.48	1.54	4.26	1.66
Midget	4.83	.83	4.14	.97	5.12	1.29
Juvenile	4.41	1.52	4.96	1.22	5.33	.96
Motivational General-Arousal						
Bantam	3.97	1.01	4.44	.83	4.46	.85
Midget	4.76	.65	3.91	.94	4.80	1.15
Juvenile	5.35	1.26	5.59	.96	5.70	.65
Motivational General-Mastery						
Bantam	3.93	1.06	4.19	.85	4.47	1.17
Midget	5.03	.69	4.82	1.15	5.30	.90
Juvenile	5.21	1.16	5.53	.65	5.57	.80

Reliability Analysis

Adopting a criterion of .70 (Nunnally, 1978), the internal consistency was determined to be acceptable for each subscale of the SIQ. Coefficient alphas (Cronbach, 1951) were calculated for each of the subscale (i.e., cognitive general, cognitive specific,

motivational general-mastery, motivational general-arousal, and motivational specific) and ranged from .70 to .84.

Time and Competitive Level Differences

To assess the basketball players' imagery use prior to, and at three and six weeks following the imagery workshop, a split-plot MANOVA was conducted (Kirk, 1995). The independent variables were the basketball players grouped by competitive level (i.e., bantam, midget, and juvenile), and time (i.e. pre-workshop, and 3 weeks and 6 weeks post-workshop). The dependent variables were the five functions of imagery as measured by the SIQ. Significant main effects was found for both competitive level (Pillai's Trace= .653, $F_{(10,60)} = 2.91$, $p < .01$, $\eta^2 = .33$) and time (Pillai's Trace= .497, $F_{(10,24)} = 2.37$, $p = .04$, $\eta^2 = .50$) with the observed power being 95.6% and 81.6% respectively. Furthermore, a significant group by time interaction was found (Pillai's Trace= .919, $F_{(20,50)} = 2.13$, $p = .02$, $\eta^2 = .46$) with an observed power of 96.0%.

With regards to competitive level, univariate analyses revealed that significant effects existed for the cognitive general ($F_{(2,33)} = 12.55$, $p = .00$, $\eta^2 = .29$), motivational general-arousal ($F_{(2,33)} = 4.79$, $p = .01$, $\eta^2 = .13$), and motivational general-mastery SIQ subscales ($F_{(2,33)} = 7.07$, $p = .00$, $\eta^2 = .30$), with the observed power being 88.9%, 77.8% and 90.5% respectively. Post hoc tests revealed that juvenile (i.e., highest level) players used more cognitive general imagery than midget players, who in turn used more cognitive general imagery than bantam (i.e., lowest level) players. Furthermore, juvenile players used more motivational general-arousal imagery than both midget and bantam players, and more motivational general-mastery imagery than bantam players.

Univariate analyses also revealed that there was a significant effect for time for the cognitive general ($F_{(2,66)} = 9.084$, $p < .001$, $\eta^2 = .22$), motivational specific ($F_{(2,66)} = 4.89$, $p = .01$, $\eta^2 = .13$), and motivational general-mastery SIQ subscales ($F_{(2,66)} = 4.59$, $p < .01$, $\eta^2 = .12$), with the observed power being 97%, 77.8%, and 75.9% respectively. Post hoc tests revealed that the basketball players used significantly more cognitive general imagery, motivational specific, and motivational general-mastery imagery six weeks following the imagery workshop in comparison to their use of these functions prior to its start.

Finally, significant interactions (see Table 1) were found for the motivational specific ($F_{(4,66)} = 3.63$, $p = .01$, $\eta^2 = .18$) and the motivational general-arousal subscales ($F_{(4,66)} = 3.39$, $p = .01$, $\eta^2 = .17$), with the observed power being 85.3% and 82.4% respectively. Given that it is generally not meaningful to interpret main effects when the interaction term is statistically significant (Pedhazur & Pedhazur-Schmelkin, 1991), only the interaction term (and not the main effects) will be interpreted for the motivational specific and motivational general-arousal subscales in the discussion. Post hoc tests revealed that bantam athletes did not change their use of motivational specific imagery or motivational general-arousal imagery throughout the intervention period. Midget athletes significantly decreased their use of motivational specific imagery and motivational general arousal imagery from pre-workshop to 3 weeks post-workshop, and then

significantly increased their use of these functions by 6 weeks post-workshop. Finally, juvenile athletes significantly increased their use of motivational specific imagery, but not motivational general-arousal imagery, from pre-workshop to 6 weeks post-workshop.

Imagery Diaries

The number of imagery sessions that the basketball players engaged in over a six-week period was added together to arrive at a frequency score. This finding indicated that players engaged in 3 to 15 imagery sessions throughout the 6-week period, with the most frequent number reported being 4. Each session ranged in duration from .5 to 90 minutes, with the average length of an imagery session being 18.21 minutes ($SD = 14.73$). The ratings of effectiveness for each imagery session were averaged across the six weeks to arrive to reveal that the participants perceived that their imagery sessions to be 68.61% ($SD = 12.91$) effective.

In addition to the frequency, length, and effectiveness of each imagery session, the basketball players also reported the location of where the imagery took place. Each written response was transcribed and the responses were divided into text units. Using deductive methods of analysis, these text units were placed into the following categories: at home, in transportation (e.g., on the bus), at school (e.g., during class), at practice, at a home game, or at an away game. In general, the players indicated that they used imagery the most at practice, with all 36 players reporting using imagery in this location during 5.05 ($SD = 2.56$) of their sessions. This was closely followed by imagery at away games, which was reported by 32 of the players (88.89%) during 2.34 ($SD = 1.23$) of their imagery sessions. Imagery was used the least at school or while in transportation, with only 3 of the players reporting using imagery in these locations (8.33%) during 1.33 ($SD = .58$) and 1.67 ($SD = .58$) of their sessions respectively.

Following the same procedures for data analysis, the content of each imagery session was placed into the following categories: skill (e.g., foul shot), strategy (e.g., offensive playing), goal (e.g., winning the game), arousal imagery (e.g., the crowds cheering), or mastery imagery (e.g., overcoming difficulty). Note, the content of an imagery session does not necessarily indicate the function the imagery was serving (i.e., why the imagery was being used). For example, a player may indicate that she imaged a foul shot. What is not known is why she imaged that shot. She may have imaged the foul shot to work on her throwing technique or perhaps to image herself successful completing the shot under the pressure of a game situation. In general, the players reported imaging skills the most over the six-week period (36 players, $M = 9.25$ sessions, $SD = 4.85$), and this was followed by strategies (28 players, $M = 3.07$ sessions, $SD = 2.31$). The images least recorded by players in the diary were arousal and mastery ones, which were reported by 1 player each. Means and standard deviations were calculated for each of the different locations recorded in the diaries as well as the content of the imagery sessions, and are presented in Table 2.

Table 2. Sample size, means and standard deviations for the location and content of different imagery sessions reported in the imagery diaries.

Measure	<i>n</i>	<i>M</i>	<i>SD</i>
Location			
Home	14	1.29	.61
School	3	1.67	.58
In transportation	3	1.33	.58
Practice	36	5.05	2.56
Home game	15	1.733	.96
Away game	32	2.34	1.23
Content			
Skill	36	9.25	4.85
Strategy	28	3.07	2.31
Goal	11	1.18	.40
Arousal	1	2.00	.00
Mastery	1	1.50	1.00

Post-Intervention Questionnaire

The written response to the post-intervention questionnaire were transcribed and then divided into text units. Using inductive and deductive methods, these text units were then organized into groups containing similar ideas or meanings (Patton, 2002). Frequencies were also calculated for answers to the force-choice questions (i.e., yes or no answers). To this end, it was found that 34 of the basketball players (94.44%) reported that the imagery training had led to improvements in their performance, and 2 players (5.56%) reported no perceived benefits. Of those players who indicated improvements to performance, 22 players (61.11%) reported specific improvements to skill technique and/or overall game play, 7 players (19.44%) reported improvements in concentration and focus, and 3 players (8.33%) reported improvements in confidence. In describing difficulties that were encountered when performing mental imagery, 15 players (41.67%) identified the problem of not having enough time to fit imagery into their training routine. Other difficulties reported by the players included not being sure of what to image (7 players, 19.44%), finding it hard to focus or concentrate during imagery (5 players, 13.89%), becoming discouraged when not experiencing immediate results on performance (e.g., imaging a foul shot just prior to performance, then missing that foul shot during the actual performance) (4 players, 11.11%), and finding imagery to be tiring

(4 players, 11.11%). In addition to these difficulties encountered when performing mental imagery, four players indicated (11.11%) indicated a problem with writing imagery down in the diary. More specifically, the players identified that it was annoying and time consuming to record their imagery use.

Twenty-seven (75%) of the basketball players reported that they would continue to use imagery in the off-season, 7 (19.44%) players reported that they would not use imagery, and 3 (8.33%) players were unsure. For those players who indicated that they would use imagery in the off-season, 16 players (44.44%) reported that they would use imagery for other sports and/or gym class, 10 players (27.78%) reported that they would use imagery to develop basketball skills and/or strategies, and 4 players (11.11%) reported that they would not change the way they used imagery in the off-season. In comparison, players who indicated that they would not be using imagery the off-season explained that they did not feel the need to use imagery because they were not involved in any other sports during the basketball off-season (6 players, 16.67%), or because they would be doing other things (1 player, 2.78%).

Discussion

The purpose of this study was to investigate the influence of a workshop aimed at developing more regular and structured imagery training and an overall increase in imagery use with basketball players. To this end, two different types of self-report measures (i.e., SIQ, diary) were used to assess patterns of imagery use during a 6-week period following the workshop.

Consistent with previous research examining imagery use (e.g., Barr & Hall, 1992; Cumming & Hall, 2002a, 2002b; Salmon, Hall, & Haslam, 1994; Vadocz et al., 1997), competitive level differences were identified. A number of different factors may explain this finding, including variations in the players' motivation to perform imagery, differences in the players' ability to effectively create and control their images, developmental differences related to the age of the players, as well as amount of experience in the sport of basketball. To date, limited research has examined why athletes are motivated to engage in imagery. Several recent studies, however, have adopted an achievement goal approach to study this issue and have found that differences in frequency of imagery use can be explained by understanding the athlete's profile of task and ego goal orientations (Cumming, Hall, Gammage, & Harwood, 2002; Harwood, Cumming, & Hall, 2003; Harwood, Cumming, & Fletcher, in press). These studies have found that athletes will be more likely to invest efforts in performing imagery when their motivational profile consists of moderate to high levels of task and ego orientation. It is possible that reported differences in frequency of imagery use found in the present study may also be explained by variations in the players' dispositional goal orientations.

Imagery ability is another potential explanation for these differences in imagery use. Most researchers agree that everyone seems to have the ability to generate and use imagery by the age of seven (Isaac & Marks, 1994; Piaget & Inhelder, 1971). However, differences certainly exist in the extent to which people can do so (Hall, 1998, Murphy &

Martin, 2002). Indeed, imagery ability appears to be one of the most important factors that will influence how effective imagery will be in enhancing performance (Hall, 1998). Several studies examining the acquisition of motor skills have found that individuals with higher imagery ability are better able to learn, retain, and reacquire skills (Goss, Hall, Buckolz, & Fishbourne, 1986; see Hall, 1998; Murphy & Martin, 2002 for reviews). Moreover, imagery ability also seems to be related to other aspects of performance, such as state sport confidence (Mortiz, Hall, Martin, & Vadocz, 1996). Although research has not directly examined whether imagery ability is related to frequency of imagery use, Cumming and Ste-Marie (2001) found that figure skaters reported an increase in both imagery ability and imagery frequency following an intervention program suggesting that a relationship may exist between these two variables.

Given that the three competitive levels are organized according to the ages of the players, it is also possible that differences in imagery use might be related to developmental differences. According to Piaget's stages of cognitive development, the highest level of cognitive ability begins at approximately 11 to 12 years when individuals enter the stage of formal operations, which is characterized by abstract thinking and enhanced problem-solving skills (Payne & Isaacs, 1995). It is also around this time when individuals enter the third and final stage in the development of attention, and marked improvements in coordination occurs for the performance of motor skills (Haywood, 1993). In the present study, the basketball players ranged in age from 12 to 17 years, suggesting that the younger players (i.e., members of the bantam team) would be just entering these final stages of adolescent development whereas the older players would have nearly completed these stages and making the transition to adulthood.

A final possible explanation revolves around the experience level of the player. Juvenile level players, who played at the highest competitive level and had the most experience in the sport, used significantly more cognitive general imagery than midget level players, who in turn used more of this function of imagery than bantam level players. This finding probably reflects the player's development of their physical performance skills and strategies. Since the bantam level players had only one to two years of experience, it is likely that they are still mastering the basic skills of basketball (e.g., dribbling, foul shooting, lay-up shots) and are probably just being introduced to strategies at the most basic level. In comparison, while mastery of skills are still important for midget and juvenile players, these players are becoming more experienced at performing their skills, and are able to incorporate them into more sophisticated strategies. It is likely that the increased importance placed on the performance of strategies with the higher competitive levels is reflected in their greater use of cognitive general imagery. Similarly, juvenile level players used significantly more motivational general-mastery imagery, the function of imagery that involves being self-confident, mentally tough, focused, and positive, than bantam level players. It is probable that the basketball players are using this function of imagery to review tough or challenging situations that they have previously encountered (i.e., playing with a sore ankle) and imagine how they will handle them in the future. The bantam level players, who in general, have less experience in these types of situations, would therefore be less likely to image them. It is also possible that the bantam level players have not yet developed the

psychological strategies that enable them to remain focused, confident, and mentally tough to the same extent as the older, more experienced juvenile players, and this is reflected in their lesser use of motivational general-mastery imagery. Qualitative studies with Olympic athletes support this notion by finding that psychological characteristics develop with increased investment and experience in the sport (Durand-Bush & Salmela, 2002; Gould, Dieffenbach, & Moffett, 2002).

With regards to changes over time, previous studies examining athletes of a similar age bracket have shown increases in imagery use following intervention programs of lengths varying from 5 to 16 weeks (e.g., Cumming & Ste-Marie, 2001; Rodgers, et al., 1991). The results of the present study suggest, however, that an intervention as short as a workshop can be successful at increasing basketball players' overall use of imagery. Some changes in imagery use were consistent across competitive levels (e.g., cognitive general imagery, motivational general-mastery), whereas other changes appeared to be specific to the individual team (e.g., motivational specific imagery, motivational general-arousal). All of the players reported significant increases in their use of cognitive general imagery and motivational general-mastery imagery from prior to the workshop until six weeks post-workshop. In comparison, bantam athletes did not change their use of motivational specific imagery or motivational general-arousal imagery. Midget athletes reported a decrease in their use of motivational specific imagery and motivational general arousal imagery from pre-workshop to 3 weeks post-workshop and then a significant increase of these functions by 6 weeks post-workshop. Finally, juvenile athletes significantly increased their use of motivational specific imagery, but not motivational general-arousal imagery, from pre-workshop to 6 weeks post-workshop.

Previous research has indicated that imagery use may be dependent on the importance of a particular function to the player (Callow & Hardy, 2001). For basketball players, who play a game that requires a heavy emphasis on strategies, it is not surprising that they increased their use of cognitive general imagery. In addition, the use of motivational general-mastery imagery would be important to all basketball players because it allows them to practice mastering challenging situations. As a result, they would develop efficacy expectations that could lead to increased self-confidence (Bandura, 1997). An unexpected pattern of imagery use that emerged for the study, however, was for midget athletes who significantly decreased their use of motivational specific imagery and motivational general arousal imagery from pre-workshop to 3 weeks post-workshop, and then significantly increased their use of these functions until 6 weeks post-workshop. This "yo-yo" pattern of motivational imagery may be related a losing streak that the midget athletes experienced during the first three weeks of the intervention period. Following discussions with the coach, it appears that the players doubted their ability to win during this period, which is probably reflected in their decreased use of imaging themselves winning (i.e., motivational specific imagery) or the atmosphere of winning (i.e., motivational general-arousal imagery). During the last half of the season, however, the midget team began to win games and even qualified for play-offs giving them a renewed belief in their ability to win, and this change was probably reflected by an increase in their use of motivational specific imagery from the fourth to sixth week post-workshop. Of course, this explanation is highly speculative and future research should

explore the reasons underlying changes in the use of imagery functions following an intervention.

A second self-report measure in the form of a diary was also used in the present study to examine the structure and regularity of imagery practice. However, analysis of the post-intervention questionnaire revealed that several of the athletes reported difficulties completing the diary because they found it to be time-consuming and/or annoying. As a result, it is possible that the information in the diary does not accurately reflect the basketball players' imagery use, but instead reflects their lack of adherence to completing the diary. One recommendation for future research using diaries as a self-report measure, therefore, would be to include a manipulation check to verify that athletes are faithfully recording their use of the psychological skill under examination. An additional weakness with interpreting the diary information is that the imagery content provided by the basketball players can only tell us what they were imagining, but not explain why. Nevertheless, the diaries along with responses to the post-intervention questionnaire provided some valuable information concerning the basketball players' imagery training. Specifically, these instruments provided information about whether the workshop was successful in educating the players on the value and benefit of imagery training, and effective in getting players to integrate imagery into their regular training program and to cope with adherence-related barriers.

As to whether the basketball players understood the value and benefit of imagery training, 94.44% reported that the imagery training had led to technical and/or psychological improvements in their basketball performance. Examples of technical improvements included increases in skill technique and overall game play, while psychological improvements included enhancements in concentration and self-confidence. As indicated earlier, a number of studies have previously reported a positive relationship between imagery use and performance. It must be noted, however, that we did not measure actual basketball performance in the present study. Rather, we were simply asking the players to report any perceived benefits they could attribute to the imagery training. In addition, 75% of the players reported that they intended to use imagery in the off-season indicating that they understood the value of continuing to practice imagery after the basketball season had ended. Together, these findings suggest that the athletes generally had a positive attitude toward performing mental imagery, which is important for adherence because our intentions to perform a particular behaviour (i.e., mental imagery) will be influenced by attitudes toward performing that behaviour. In turn, individuals with a strong intention are more likely to engage in the behaviour (Ajzen, 1985). However, several of the players reported becoming discouraged with using imagery when they did not see immediate performance benefits, which demonstrates the need to better educate athletes on the processes through which imagery influences performance.

In their diaries, the players reported using imagery regularly at practice and games, suggesting that they were successful at integrating imagery into their existing training program even though nearly half of them perceived that they did not have enough time to perform imagery. In addition, players were generally consistent with their imagery

content by imaging mostly skills and strategies of the game even though several of them identified the problem of not being sure of what to image. The players perceived their images to be only somewhat effective, which may be due to difficulties encountered with focus and concentration, as well as finding imagery to be tiring. These difficulties are not too surprising considering that imagery is a mental skill that requires mental effort in order to create and control the images (Cumming & Hall, 2002a; Orlick, 1990). Orlick (1990) has suggested that athletes counter this problem by engaging in shorts bout of high quality imagery when first starting to use it, and then slowly increasing the length of their imagery sessions over time.

Limitations

Findings from the present study also demonstrate that an intervention as short as a single workshop can impact on an athletes' imagery use. It is important to note, however, that these findings would be strengthened by having comparisons groups who received the intervention in different amounts (e.g., multiple workshops) or not all (e.g., control group). In doing so, we would be better able to conclude that changes in patterns of imagery use could be attributed to the workshop, and not to other factors such as the logbook serving as a reminder to perform imagery or demand characteristics. But, it is an interesting finding that no specific targets were set for the amount and frequency of imagery use to be performed by the athletes, and imagery use generally increased among the three skill levels. Conversely, when targets were set in previous research studies, adherence was usually low and dropped off rapidly over a short period of time (e.g., Bull, 1991). These findings suggest that it is important for practitioners to consider how the psychological skill training program will be delivered to the athletes. In addition, the athletes' perceived barriers and difficulties to using imagery suggest that future research should investigate the optimal length of an imagery intervention for developing and maintaining regular imagery use and identify effective adherence-related strategies specific to the age-group under study.

Conclusions

There has been a lack of research examining the development of imagery use in youth sport athletes, but those studies conducted to date have produced some encouraging findings. For example, research with children aged 7 to 10 found improvements in the accuracy and technical quality of tennis table shots for those in a mental imagery training group as compared to those in a video observation group or a control group (Li-Wei, Qi-Wei, Orlick, & Zitzelsberger, 1992). In addition, a study retrospectively examining patterns of imagery use across athletes' careers showed that more elite athletes could be distinguished from their recreational counterparts by their amount of imagery practiced six years into their careers (Cumming & Hall, 2002a). Together with the present research, these studies support the benefit of conducting interventions with youth sport athletes aimed at teaching them the importance and value of using imagery, and how they can effectively incorporate imagery into their regular training.

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Appendix

Post-intervention Questionnaire.

1. Has your basketball performance improved because of the imagery training that you have been doing?
 - a. If you answered yes, please comment on how imagery helped your performance.
2. What difficulties did you encounter when performing mental imagery? (e.g., not sure of what to image, found it tiring, easily distracted, etc)
3. Do you plan on continuing to use mental imagery during the off-season?
 - a. If you answered **yes**, please comment on **how** you will use imagery during the off-season.
 - b. If you answered **no**, please comment on **why** you will not use imagery during the off-season.

Copies of the imagery workshop can be obtained from the first author.

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