Mental Imagery in Athletes With Visual Impairments

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The purpose of this study was to investigate imagery experiences in performers with visual impairments. Structured, in-depth, qualitative interviews were conducted with six elite goalball athletes regarding the processing and use of mental images in training and competition. Interview transcripts were analyzed using deductive and inductive procedures and revealed four general dimensions describing the athletes’ uses of imagery. Participants reported using imagery for cognitive and motivational purposes in both training and competition. Imagery was also suggested to be utilized from an internal perspective with the processing of images derived from a range of modalities. The findings suggest that visual impairment does not restrict the ability to use mental imagery and that psychological interventions can be expanded to include the use of all the athletes’ sensory modalities.

The ability to image performance has received considerable attention in sport psychology research and is viewed as a key component in psychological skills training (Orlick & Partington, 1988; Vealey, 1988; Vealey & Walter, 1993). Investigations of the relationship between mental imagery and sporting performance suggest that imagery of a particular sports skill improves the physical performance of that skill (Driskell, Copper, & Moran, 1994; Murphy & Jowdy, 1992; Porretta & Surburg, 1995; Surburg, Porretta, & Sutlive, 1995). Several theoretical approaches in the motor domain have been suggested to explain the effect of imagery on motor performance (i.e., Jacobsen, 1930; Lang, 1977, 1979; Sackett, 1934); however, while these theories provide some explanation for the impact of imagery use upon motor performance, they do not account for the range of imagery outcomes used in sport psychology (Martin, Moritz, & Hall, 1999; Murphy, 1990). In an attempt to further comprehend the concept of imagery and account for its various applications, Paivio (1985) proposed an analytic framework for imagery effects. Paivio suggested that imagery can affect motor responses through both cognitive and motivational systems. Such a systematic framework has subsequently allowed
researchers to examine the effects of imagery on psychological constructs and motor skill development (Callow, Hardy, & Hall, 2001; Martin et al., 1999).

Despite this advancement, however, empirical research has identified the existence of more types of imagery than Paivio’s framework identifies (Hall, Mack, Paivio, & Hausenblas, 1998; White & Hardy, 1998). Paivio’s theory is also limited in that it does not account for the influence of situational or personal factors upon the use of the image (Martin et al., 1999). In order to address these limitations and attempt to represent how athletes use imagery, Martin et al. developed an applied model of imagery in sport. The model is constructed around the type of imagery an athlete uses in relation to the competitive situation, with the athlete’s imagery ability viewed as the determining factor in relation to the cognitive, affective, and behavioral outcomes. As different types of images are proposed to be related to different types of outcomes (Paivio, 1985), imagery is suggested to possess a range of functions that athletes utilize to achieve different results (Hall et al., 1998; Hall, Rodgers, & Barr, 1990; White & Hardy, 1998). A taxonomy of imagery use has subsequently been developed to classify five different types of imagery, including three motivational and two cognitive types (Hall et al., 1998). Motivational-specific imagery represents images of specific goals and goal-orientated behaviors, while motivational general-mastery imagery demonstrates effective coping and mastering of challenging situations. Motivational general-arousal imagery represents feelings of relaxation, stress, arousal, or anxiety in conjunction with sport competitions. Cognitive specific imagery represents images of specific sports skills, while cognitive general imagery includes images of strategies and tactics related to a competitive event.

In addition to the outcome for which the athlete uses the image, an additional variable important in skill development is how the image is viewed by the performer (i.e., internal or external). Hall et al. (1990) observed that athletes reported the use of both internal and external perspectives of imagery to a relatively equal extent and were also able to switch back and forth between the two perspectives when imaging themselves performing. Further explanations for the function of image perspective in relation to performance have been proposed by White and Hardy (1995). Here the authors suggest that external visual imagery should have a superior effect on the acquisition and performance of skills that are dependent on form for their successful execution, as the images are of a complex nature. In contrast, internal visual imagery is proposed to be superior for the acquisition and performance of open skills requiring perception for their successful execution. Initial support for these proposals has come from Hardy and Callow (1999) who observed that external visual imagery was superior to internal visual imagery in performances on tasks where form was viewed as important.

Although mental imagery is purported to have kinesthetic, spatial, tactile, auditory, olfactory, and emotional components, investigations have predominantly focused on the visual modality of the imagery experience. This is despite the fact that the other modalities may influence or enhance athletic performance. Kinesthetic imagery, for example, has been suggested to enhance performance
more than visual imagery alone, enabling the athlete to match the timing and feel of a movement to the visual image used (Hall et al., 1990; Hardy, 1997; Hardy & Callow, 1999). Investigation of this imagery component has also been restricted by the discussion of spatial and tactile imagery under the heading of kinesthetic imagery rather than acknowledging the three types as separate modalities. The lack of research into other modalities of the imagery experience in sport is particularly pertinent when one considers that in addition to the visual aspects, there appears to be no reason why mental imagery cannot be utilized by athletes who are blind or have visual impairments. Indeed, Paivio (1986) suggests that everyone has the ability to generate and use imagery, but not to the same degree. To date, however, no empirical investigation has been conducted into imagery use in such populations. The examination of mental imagery use in athletes with visual impairments therefore represents a unique perspective from which to explore such a phenomenon.

Research conducted in clinical psychology examining persons who are blind or possess visual impairments suggests that visual pathways and processes may play an active role in the imagery use and perceptual ability of an individual. Sadato et al. (1996) have reported a phenomenon referred to as tactile “seeing” in the visual cortex, whereby participants who are blind produced a reaction in the visual cortex when exposed to a tactile stimulus. Sensitivity to such information, therefore, may increase in participants who are blind as more cortical tissue is devoted to presenting nonvisual information. When investigating the spatial and pictorial components of visual imagery in populations exhibiting blindness, Cornoldi, Bertuccelli, Rocchi, and Sbrana (1993) discovered that people who are blind did not have any difficulty matching a mental representation of a pathway to a tactually explored wire silhouette. Cornoldi et al. suggested that these findings were probably due to participants who are blind using other sensory modalities and being skillful in tactual exploration. The authors also suggested that the study of visuo-spatial imagery abilities in populations exhibiting blindness may be instrumental in understanding the contribution of visual experience to imagery processes. Additional support for this belief comes from neurophysiological research that provides evidence of shared processing for imagery and perception and suggests that imagery can activate visual association areas in the brain (Farah, 1988). It has also been identified that imagery and perception share forms of representation but may achieve them in distinct ways. Subsequently, models developed have shown that access to sensory knowledge can occur through multiple pathways (Gazzaniga, Ivry, & Mangun, 1998); for example, blindsight is a phenomenon whereby patients suffering a lesion in their visual cortex are able to respond to visual stimuli presented in the blind part of their visual field (Weiskrantz, 1986). Collectively, these studies suggest that the visual pathways in participants who are blind or have visual impairments are to an extent still intact and of potential use to the individual in the processing of images.

Roder and Rosler (1998) studied whether performance in a spatial imagery task depends on the modality that is used to explore a spatial layout or on the vision status of the person. Success at the task was not found to be influenced by the vision
status of the participants or by the mode used to acquire the spatial layout, suggesting that image scanning is based on mental representations that are not linked to one particular modality. Roder and Rosler (1998) also found support for the concept that participants with visual impairments were capable of using imagery but assumed that such participants cannot use the visual modality of imagery. Tinti, Galati, Vecchio, De Beni, and Cornoldi (1999) have, however, reported that populations exhibiting blindness can use images that have the essential characteristics of visual objects, such as properties of shape and location in space to enhance memory. Despite these initial investigations, research into the context of imagery use in individuals who are blind or have visual impairments is still relatively limited.

Traditional methods of inquiry into mental imagery, particularly in the sport domain, have typically adopted a quantitative perspective. Recently, however, researchers have successfully employed qualitative techniques to gain an insight into the athletes’ actual experiences of mental imagery. White and Hardy (1998), for example, investigated imagery use by elite performers using standardized interviews. Experiences of imagery were observed to be unique to each individual, with athletes able to emphasize or manipulate certain aspects of the content of their images for a variety of functions. One of the benefits of qualitative interviewing, therefore, is that it allows the researcher to discover and gain access to the in-depth perspective of the person being interviewed (Patton, 1990). One type of qualitative paradigm appropriate to explore the topic of mental imagery is the phenomenological experience. This allows researchers to search for the central underlying meaning of an experience and describe the meaning of the lived experiences for several individuals about a concept or phenomenon (Creswell, 1998).

The research conducted into mental imagery use in persons with visual impairment and athletic individuals highlights several areas for further investigation. First, there is a need to study the use of mental imagery in athletes with visual impairments per se, as no known studies currently exist. Second, there is a need to establish whether visual components exist in images created by athletes who are visually impaired. An absence of visual imagery in this population of athletes could, therefore, detract from the ability to use mental imagery and require the athlete to compensate by using other modalities. Third, research investigating imagery use in sighted athletic populations has highlighted the need to consider the use of other modalities of the imagery experience in addition to the visual component, such as kinesthetic, spatial, tactile, and auditory imagery. Finally, as existing studies of mental imagery in sport and exercise psychology have typically adopted a quantitative approach, there is a need to consider more in-depth, qualitative approaches to better understand this phenomenon. Therefore, the purpose of this study was to investigate the use of mental imagery in athletes who are visually impaired. Specifically, a qualitative methodology was used to explore the athletes’ experiences of their processing and use of mental imagery in relation to athletic competition and training and establish any effects of visual impairment on the performers’ ability to image.
Method

Participants

Selection of participants was conducted via purposive sampling procedures (Lincoln & Guba, 1985; Patton, 1990). Specifically, information-rich cases were selected where study would illuminate the questions under investigation. Information-rich cases are deemed those that allow the investigator to learn a great deal about issues of central importance to the purpose of the research (Patton, 2002). Participants were selected from the sport of goalball, which is a cross between indoor football and handball. It is played by teams of three-a-side using a ball that contains a bell to guide the players who are all visually impaired.

A national squad of elite female goalball players were informed of the nature of the study and invited to take part, 6 of whom agreed. The participants ranged in age from 17 to 36 years ($M = 21.8; SD = 8.0$). Participants had been playing international level goalball for an average of 6 years ($SD = 2.4$). The participants were all of “B1” class, indicating a high degree of visual impairment. All of the participants had represented Great Britain at the Sydney 2000 Paralympic Games. The sample was therefore deemed to represent an elite population of Paralympic athletes with visual impairments. Criteria for elite status was based upon the classification that stated participants had to be currently competing or have competed internationally at major championships, such as the Olympic Games, European Championships, and World Championships. In order to facilitate trust and credibility with the sample population and allow the retrieval of in-depth information, the first researcher had previously established prolonged contact with the participants while working with the country’s National Paralympic Association and was therefore familiar with the intricate terminologies and idiosyncrasies of the sport (Ekland, 1994). Prior to the interview, participants were questioned regarding their level of exposure to sport psychology and mental skills training. No participants reported having previously received any mental skills education or formal sport psychology intervention training prior to contact with the researcher in the current study.

Interviews and Interview Protocol

All of the participants took part in a semi-structured interview lasting between 60 to 90 minutes ($M = 70.8; SD = 10.7$). In order to maximize recall, participants were interviewed within the time frame of the competitive season (cf., Edwards, Kingston, Hardy, & Gould, 2002). Interviews were conducted away from the competitive environment in order to minimize bias. All of the interviews were tape recorded and were conducted by the same individual, the lead researcher. The interviewer was trained in qualitative interview techniques and had several years of previous experience working with elite Paralympic populations. In addition, in order to acknowledge any potential subjective researcher biases, a reflexive journal was compiled by the interviewer throughout the study.
An interview guide was used to standardize the interviews and to minimize bias (available from the lead author). The structure of the interview guide was based upon previous research into mental imagery, both in athletic populations and populations exhibiting blindness (Callow et al., 2001; Cornoldi et al., 1993; Hardy & Callow, 1999; Martin et al., 1999; Tinti et al., 1999; White & Hardy, 1998). In accordance with the recommendations of Patton (1990), a list of probes to be used during the interviews was also devised. Probes were derived from question items included in previous psychometric measures employed in mental imagery research such as the Sport Imagery Questionnaire (SIQ; Hall et al., 1998). The interview guide consisted of five sections. Section one contained introductory comments, the purpose and definitions of the study, together with a declaration of the individual’s rights. Participants were then asked about competing at recent important events, but if recall was problematic, they were asked to take their time, and if they still could not remember, they were to tell the interviewer rather than guess (no participants stated experiencing recall problems during the interviews). It was also made explicit to participants that they could draw upon all aspects of their experience as a competitive athlete to create an overall framework. In order to help establish the parameters of the study and familiarize the participants with self-reflection, section two of the guide asked questions relating to training regimes, competitive history, and personal reasons for competing. In section three, in order to provide orientation toward the central themes of interest, participants were provided with the following definition of mental imagery and asked to confirm their understanding of the phenomenon.

Those quasi-sensory and quasi-perceptual experiences of which we are self-consciously aware and which exist for us in the absence of those stimulus conditions that are known to produce their genuine sensory or perceptual counterparts. (Richardson, 1969, p. 2-3)

The fourth and main section of the interview invited participants to discuss their experiences of mental imagery use during competition and training sessions. Areas of questioning were generated around topics related to the study of mental imagery in sporting performance: the use of mental imagery by the participant, the type of mental imagery used (i.e., cognitive or motivational), the processing of any mental images experienced, the type of imagery perspective employed, the temporal phases when imagery was employed during the athlete’s training and competition, and the specific outcomes or purposes that mental imagery was used to influence. The closing section summarized the interview experience and invited the interviewee to discuss any issues that may have been overlooked by the researcher.

The study was pilot tested on two female participants with visual impairments. The pilot study enabled the interviewer to practice interview techniques, to elucidate further on topics not covered in the questions, and subsequently to make any adjustments to the content of the interview questions and structure. Following the pilot interviews, performers were invited to reflect upon the style and content of
the questioning and probes and provide feedback on the interviewer’s style and atmosphere created during the interview. The pilot interviews were also videotaped and observed by the interviewer (the first author), the second author, and one additional colleague. This process generated feedback regarding interviewer style, mannerisms, and body language and also gave an indication of the content and flow of the interview. The pilot interviews highlighted the need to offer further explanation of terminology related to mental imagery used in some of the questioning. Subsequently, for the main study, questions were refined to include only necessary terminology and where appropriate, detailed definitions of such terminology were provided. In one such example, further detail was added to the explanation of internal and external imagery perspectives.

Data Analysis

Participants’ experiences of the processing and use of mental imagery were analyzed using hierarchical content data analysis procedures (Patton, 1990). Analysis of data comprised several stages. First, all tape-recorded interviews were transcribed verbatim by the researcher following the interviews with the participants. The researcher then read and reread each interview transcript until familiar with the content in order to gain an overall sense of each athlete’s experience. Next, raw data themes were identified from quotes, characterizing each participant’s responses within each area of the interview. Data were then appropriately coded to produce a set of concepts that was deemed to adequately represent the information included in the interview transcripts. After establishing raw data themes, an inductive and deductive content analysis was conducted to identify common themes from the lists of raw data obtained. Deductive analysis ensured that answers discussing specific content were related to the question being asked. Once content responses were matched to “appropriate questions,” inductive analysis was conducted. Here, first and second level themes established were labeled “higher order themes,” with the highest themes giving a general description of the experience labeled as “general dimensions.” Lastly, for purposes of verification, the completed findings, including interview transcripts, raw data themes, higher order themes, and general dimensions were presented to an independent researcher to act as devil’s advocate. Here the intention was for the researcher to read and reread the findings and question or raise concern about any of the researcher’s interpretations or inferences made through the analysis (cf. Creswell, 1998). An experienced sport psychologist trained in qualitative interview methods and versed in the mental imagery literature served as an independent researcher. Any comments, concerns, or queries raised by the independent researcher regarding the analysis were then acknowledged, clarified, or changed as appropriate by the first author.

A reflexive journal was kept by the first researcher throughout the duration of the project in order to log any subjective opinions, feelings, or experiences with regard to the research phenomenon. Such reflexivity allows for a description of the researcher’s experiences in order to assist the reader in the interpretation of the essence of the experience for the participants (Creswell, 1998). During
the interview process, several key themes emerged that had been noted by the researcher as an expectancy of the study, namely a significant reliance on the spatial aspects of the imagery experiences. However, a theme that had not been anticipated by the researcher was a large number of references to the use of sight in the participants’ imagery experiences. The term visualization was used on a regular basis by the participants throughout the interview process; this term was not used by the interviewer in any questions as it had not been an expected response. Although previous research had acknowledged activity in the visual cortex of participants who are blind (i.e., Sadato et al., 1996), little research has shown evidence of a visual aspect to imagery experiences by participants who are visually impaired. The researcher’s personal use of mental imagery in a sporting context is largely based around the visual aspect of the mental imagery experience, and the researcher noted experiencing similar images to those the participants were describing. Prior to the interviews, it was also noted that the participants’ images were likely to be constructed from an internal rather than an external perspective, due to lack of experience of sight from an external perspective as a result of their visual impairment. This theme subsequently became apparent when analyzing the interview transcripts.

Results

The transcribed interviews resulted in 90 pages of text, with analysis of data producing 13 higher order sub-themes and 11 higher order themes forming four general dimensions describing the imagery experiences of the participants. Several themes emerged that were found to be related to the processing and use of mental imagery and are presented in the following figures (see Figures 1-4). The figures represent common themes drawn from all participants in order to give an overall impression of the groups’ experience of mental imagery, rather than the specific number of raw data statements generated by the participants. Figure 1 represents the athletes’ experiences of the consciousness and perspective of imagery during performance and training. Figure 2 denotes the range of sensory modalities employed by the athletes in the processing of the imagery experience. Figure 3 depicts the variety of functions and types of outcomes that mental imagery was used to achieve. Finally, Figure 4 details the athletes’ indication of when imagery was used across the temporal phases of training and competition.

Processing of Mental Imagery: Processing Perspective

The first section of the interview invited participants to discuss their experiences of how mental imagery was processed together with the perspective that this image was viewed in by the athlete. A key theme that emerged from the participants’ experiences was related to the consciousness and control of the image (Figure 1). Specifically, participants reported experiencing forms of mental imagery that were
deemed to be within (i.e., conscious) and out of their control (i.e., unconscious). In relation to conscious control over images, one participant stated the following:

I know she had a good shot but she was definitely the weakest in defense and I visualized . . . definitely, you know . . . on purpose, the first shot that I was gonna throw down at her.

In describing unconscious imagery experiences, one participant stated, “It’s a sub-conscious thing . . . I don’t know I am doing it, but I definitely get an image in my mind.” Another athlete suggested this:
Figure 2 — Processing of mental imagery: Senses employed.
I think about going into “my zone”. I certainly use imagery in terms of focusing. I think about how I should be feeling, like focus. Concentrating, getting in the right frame of mind.

I have images like if I got the gold how cool would that be. Building up to it out there I was like yeah, we can really do this we can really win a medal. I always want to win and think about winning.

I think about the game and things that happened in the last game. I imagine sometimes blocking the ball and rolling it to center or sometimes doing a quick return with it. I always remember and imagine the actual game.

I always just imagine it’s coming straight down my line. Thinking about the first shot really, and it hitting me. I do with blocking and trapping it imagining where you are on court, where the goal, the opposite goal is imagining where the player is and again the goal. You image of how you want to throw the ball and how you want to defend the ball. If I was taking a penalty I would try and visualize where I was trying to put the ball. I imagine throwing the ball hard.

**Figure 3 — Types of mental imagery employed.**

Sometimes it pops into my head, but not consciously, I don’t realize that I’m doing it until the image comes into my mind.

When discussing the perspective (i.e., internal or external) from which the participants experienced their images, it was found that all the forms of mental imagery used were deemed to be constructed from an internal perspective for this
particular sample of elite athletes with visually impairments. In relation to the experience of an internal imagery perspective one participant noted this:

It’s not like I’m watching myself, not like a picture that moves, like a TV screen... I guess it’s like from within me.
Another athlete suggested the following:

It’s definitely from within me. . . . It’s definitely through my eyes rather than being on a TV screen or video. I try to imagine where the goal is and try to place the ball where I think the post is.

Processing of Mental Imagery: Senses Employed

The second topic of the interview asked participants about their experiences of the different sensory modalities that were employed in the processing of the mental image. Analysis of the transcripts revealed that participants reported utilizing a broad range of sensory modalities in the imagery experiences, including visual, spatial, tactile, kinesthetic, and auditory forms. These experiences are consistent with previous research reported in the psychology literature that suggests imagery can and should involve as many senses as possible (i.e., Paivio, 1985).

The first higher order subtheme that emerged from the analysis described the athletes’ experiences of both general and specific forms of visual images or awareness in the processing of mental imagery. General forms of visual imagery were described by participants as being related to having some visual picture or awareness of an aspect of their performance. For example, one performer suggested this:

I have a very rough picture of the court in my head. . . . Although it’s very hard to call it a picture . . . I’d say I just have this feeling . . . or . . . or an awareness of the court and what happens on it.

In addition to the general awareness of visual images, participants also reported experiencing specific forms of visual imagery related to performance. The following quotes by two different performers highlight the specific use of their visual imagery during actual performances in matches:

When I hear the ball over to the left, I almost see the ball over to the left in my mind, I think I have a picture of the court when I’m playing it, you can just like see the ball coming to you.

During matches I try and visualize where the ball is. . . . I would try and visualize where I was trying to put the ball. You do actually see it (the ball) in your mind.

The participants’ general experiences of visual imagery reported here would appear to support existing research into individuals with visual impairments that suggests participants are capable of utilizing the pictorial components of visual imagery (Cornoldi et al., 1993; Tinti et al., 1999).
In addition to the reporting of the visual aspects of the sensory modality, a further theme that was identified by participants was the use of the spatial modality in the processing of their mental images. For example, one performer reported the use of spatial imagery as part of the prematch preparation routine:

Before the match I will tend to stand behind an opponents’ goal, or our goal, and just close my eyes and imagine aspects of the game . . . say like . . . uhm . . . me in my position defending a ball or making a play somewhere else on the court.

Another performer suggested that the spatial aspects of imagery were employed during the performance itself:

It’s not visual or anything but . . . you know where the opposition are, you know where you are on the court, what side you are on and how far away from the goal you are . . . just aware of yourself in relation to the performance I guess.

A further theme identified by participants in their imagery processing was the use of kinesthetic images. This form of imagery was described to represent the “feel” of the movements in relation to the athletes’ performances.

I know where the ball is . . . I can feel it. You get a feel . . . touch . . . or sensation for the ball and the court. I feel the pass or the shot or the movement and that helps with my game, and ultimately my performance.

Participants also reported the use of aspects of tactile imagery. Here, tactile imagery was described as a perception of “touch” in athletes’ experiences:

I definitely have touch sort of things . . . definitely. I can feel the ball . . . feel it on my hands, and with blocking and trapping I concentrate on the contact, how it feels when it hits.

A final theme that emerged from the analysis of the sensory modalities employed was related to the participants’ use of auditory images in performance. One participant stated the following:

When I think about throwing the ball at a wall, I can hear the bells from the wall and it sounds hard. This helps me to judge the pace of the ball in relation to me and the court.

Despite these experiences, auditory imagery was not suggested to be as prominent as the researcher had first expected. This modality was suggested to be employed by the participants to a lesser degree than visual and spatial imagery. One participant suggested this:
The sounds are important, but the visual picture I have in my head and the feel for the court and the ball are just as, if not more, important.

The finding regarding the use of auditory imagery are unexpected on two accounts: first as goalball is a sport dependent on auditory skills, and second as persons with visual impairments have been shown to have a reliance on auditory skills (Tinti et al., 1999). It should be noted, though, that during the interviews, the participants described the experience of several images that included a combination of visual and kinesthetic, spatial, or tactile forms and were accompanied by the presence of some form of auditory image.

Types of Mental Imagery Employed

When asked to describe the types of imagery used during competition and practice, participants reported using all of the five types of mental imagery identified by the taxonomy for classifying imagery use in athletes (Hall et al., 1998) and the applied model of imagery use in sport subsequently developed by Martin et al. (1999). A first higher order theme that emerged identified the use of motivational types of imagery. This category featured three higher order subthemes describing the use of motivational-specific, motivational general-mastery, and motivational general-arousal imagery. An example of motivational-specific imagery described by one participant was the following:

I think about winning a lot. I’ve thought about what it would be like to win the Games. About the ceremony and all that and everything that accompanies it. It drives you on.

Another participant described the experiences of motivational general-arousal imagery:

Before matches, I do the mental preparation thing to get myself psyched up. I kinda see myself performing, scoring, and doing things on the court. I use it as part of my routine to get me going and pumped for performing.

When discussing their use of motivational general-mastery imagery, one participant stated this:

I sometimes think about how I should be feeling, like focusing and concentrating, getting in the right frame of mind to play.

A second higher order theme identified by participants described the use of cognitive types of imagery in performance. Specifically, the subthemes of cognitive specific and cognitive general imagery were reported. When discussing cognitive general imagery of performance, one performer said this:
I imagine moves or plays that we perform during the match . . . something like . . . like blocking the ball and rolling it to center, or sometimes doing a quick return with it, so they’re like off balance and I score.

Another participant described the use of cognitive specific imagery in relation to the performance of a specific skill during the match:

If I was taking a penalty, I would try and visualize where I was trying to put the ball for that shot . . . I would try and imagine throwing the ball hard.

Use of Mental Imagery in Competition and Training

The final theme that emerged from the analysis described a general dimension relating to the participants’ use of mental imagery across the temporal phases of their athletic performance. Specifically, themes emerged related to the participants’ use of mental imagery during competition and training. The participants’ main use of imagery was suggested to occur directly prior to and during competition. One participant stated the following:

I mainly use it (imagery) to get myself prepared for the game . . . you know focused and ready to play. I also used to do it in the match. If I was taking a penalty before I actually take the shot, I would try and visualize where I was trying to put the ball, like where in the goal.

A further higher order subtheme also emerged describing the participants’ use of imagery in training and practice. For example, one athlete recalled this:

I did do that (image) in Sydney, before our first game . . . I did it not just on the day, but like a week before. Just running through my mind what I wanted to get out of the practice sessions.

Another athlete suggested the specific use of mental imagery during training as illustrated in the following quote:

I’ve definitely used it in training, I’ll imagine how I should do things, I imagine throwing against a wall, passing to my teammates, and working on my defense.

The athletes’ experiences of imagery use would appear to support the findings of Martin et al. (1999) who suggested that athletes use mental imagery in training periods, between competitive events, and immediately prior to and during a competitive event. Research by Hall et al. (1990) found that athletes use mental imagery more in conjunction with competition than in practice but that athletes competing at higher levels use imagery to a greater extent both in training and
competition. The current investigation would therefore appear to provide initial support for these findings in the context of elite athletes with visual impairments.

A final theme that emerged, however, not previously accounted for by the model of imagery use, was the participants’ reported experiences of the use of mental imagery following competition. Specifically, this form of imagery was suggested to be used by athletes in order to analyze or reflect upon the recent performance. One participant described using mental imagery to consider performance in a previous match:

When we are traveling back from the match, or . . . sometimes . . . in my room after, or the next day, I run through my performance. I go through all the shots I made and try and analyze where I went wrong, what I did well, and how I can improve.

Discussion

The purpose of this study was to examine experiences of the processing and use of mental imagery during training and competition by athletes with visual impairments. The results suggest that athletes with visual impairments process mental images predominantly from an internal perspective. Input for this imagery appears to be derived from all of the individual’s sensory modalities, including kinesthetic, spatial, tactile, visual, and auditory forms. In addition, athletes also reported using both cognitive and motivational forms of mental imagery in order to achieve psychological outcomes in a variety of training and competition contexts.

A key finding from the themes identified in the analysis regarding the processing of mental images was that all of the participants reported utilizing mental imagery from an internal perspective and did not appear to have any experiences of imagery from an external perspective. Investigations conducted with sighted performers have shown that athletes have the ability to use both imagery perspectives and that the use of a combination of perspectives enhances the mental imagery experience (Hall et al., 1990). As all of the participants in the current investigation possessed visual impairments, it is therefore feasible that the inability to use external visual imagery reported may be related to the participants’ vision status. Previous research investigating imagery perspective in sport psychology suggests that external imagery is beneficial in skills requiring form, as this allows the athlete to gain information from a perspective that they would not usually experience in performing the skill or through using internal imagery (Hardy & Callow, 1999; White & Hardy, 1995). As the participants in the current investigation could not experience a third person visual perspective in every day life due to their vision status, this may account for the athletes’ lack of ability to form an external image. In addition, this may also be due to the athletes not having a concept of an external image or, through a lack of processing capacity, to form images from an external perspective. As open skills are suggested to benefit more from an internal perspective of imagery than those of a closed skill nature (White &
The use of only an internal imagery perspective should not affect the benefits athletes with visual impairments can gain from mental imagery (goalball is largely an open skilled sport). For specific skills rehearsed in training and practice that are a closed nature, these athletes may not be gaining the most benefit from their use of mental imagery. Due to the nature of the sport in the current study, however, together with the findings from previous research, it is unclear if athletes with visual impairments could learn to develop an external perspective of imagery or whether visual impairment prevents this function. The findings in the current study would seem to suggest that the absence of visual ability in the participants appears to cause a dependency on internal perspectives of imagery. It should be noted, though, that all the participants interviewed reported using visual images, despite their visual impairment. Interestingly, therefore, it may be possible for some form of external imagery to be utilized by such a population of athletes, as external imagery makes use of the visual modality of imagery.

An unexpected theme that emerged from the investigation was that visual imagery was described as being utilized in the participants’ imagery experience. Participants used words such as “visualization” and “picture” when describing their imagery experiences, even though these terms were not used by the interviewer. This finding would appear to reflect the participants’ perception of the senses that they employ in their mental imagery. The findings are also unique in that previous research (Cornoldi et al., 1993; Roder & Rosler, 1998; Sadato et al., 1996; Tinti et al., 1999) has not provided evidence of participants with visual impairments specifically reporting the use of visual imagery. Cornoldi et al. (1993) have however observed the use of visuo-spatial imagery, which is suggested to be a combined process of the spatial and pictorial aspects of mental imagery. Other research has found evidence to suggest that participants with visual impairments have function in the visual cortex and associated visual pathways, which may suggest the potential for visual imagery (Sadato et al., 1996; Weiskrantz, 1986). Research in this area, though, has predominantly adopted a quantitative perspective by comparing the participants’ visual ability to performance in spatial tasks, and hence focusing on the cause of the impairment rather than the effects. While the current study does not look at the cause of the participants’ visual impairment nor does it make direct comparisons with sighted athletes, it does examine the current level and use of mental imagery ability that athletes with visual impairments possess. Future research should therefore seek to make such comparisons between sighted individuals and those with visual impairments in order to further enhance the understanding of the use and effects of the visual modality in the imagery experience.

A further finding reported by athletes with visually impairments was the use of other sensory modalities in the processing of the imagery experience. For example, kinesthetic, spatial, and tactile forms of imagery were utilized on a regular basis. This finding would appear to agree with previous research that states spatial location is presented adequately in participants who are blind (Cornoldi et al., 1993). In addition, findings in sport psychology research have shown that kinesthetic forms occur in imagery from an internal but not external perspective and that the use of kinesthetic images enhances the overall imagery experience (Hardy, 1997; White...
With regard to other sensory modalities, Tinti et al. (1999) have reported that individuals who are blind perform well when the auditory modality is involved in imagery but not when the visual modality is required. The current investigation does not appear to agree with these findings, as participants reported the use of visual and auditory imagery. For sport psychology researchers, this finding raises an interesting issue and highlights a limitation in Martin et al.’s applied model of imagery in sport (1999), as the imagery ability aspect of the model does not consider the auditory function in the performer’s use of the image.

Despite the failure of the model to consider the auditory component of the image, strong support is provided in the current study for the athletes’ use of different types of imagery as described by the taxonomy developed by Hall et al. (1998), with all five types of imagery use described as being utilized by the participants. The current study also offers support for the imagery type aspect of the applied model for imagery use in sport based on this taxonomy (Martin et al., 1999). Further concurrence with the model was provided in the current investigation when participants were asked to consider their use of mental imagery across the temporal phases of training and competition. Here it was indicated that mental imagery was used in training and practice and prior to and during the athletes’ competitive performance. An additional theme emerged: The participants identified the use of imagery post-competition as a means of self analysis of their past performance. This phase is not specifically mentioned in the model by Martin et al. (1999) and suggests that the model does not yet describe all uses and outcomes of mental imagery.

Due to the exploratory nature of the research question, the current investigation adopted a broad approach in examining mental imagery experiences in a very specific sample. Subsequently, great potential exists for future research to examine a smaller range of imagery components and functions in greater detail. By doing so, it is hoped a better understanding regarding the underlying mechanisms of vision and mental imagery will emerge, specifically the relationship between visual imagery and imagery using other sensory modalities. It is also important to acknowledge in the present study that the history of the participants’ visual impairment status was not available. Differences within visual impairment may subsequently have influenced the manner and degree to which imaging took place. Future investigations need to compare the athlete’s imagery ability and the processing of images as a function of the various categories of visual impairment. Specifically, research should examine the type of imagery used by each group, the modalities utilized in the imagery experience, and the effectiveness of the variables of imagery in achieving intended outcomes. Comparisons of imagery and visual ability could also be made between groups of participants with visual impairments who have lost vision at a similar time of life. Detail could also be provided concerning the history of the participants’ visual impairment. Such information will help to increase understanding of the role memory plays in the imagery experience (Tinti et al., 1999), along with the functional capacity of the visual cortex (Sadato et al., 1996; Weiskrantz, 1986). Finally, the current investigation identified a reliance on an internal imagery perspective in this sample of athletes with visually impairments. Due to the small sample size, however, it not possible to determine whether this finding is unique.
to the specific population of Paralympians or characteristic of athletes who have visual impairments per se. Future research should therefore attempt to establish whether the ability to construct external imagery is possible in such populations and then examine the efficacy of external imagery perspective interventions with athletes who are visually impaired. In order to further the understanding of the benefits of the different perspectives of imagery, the imagery outcome each type facilitates and the imagery outcome the different perspectives achieve (cf., Callow et al., 2001) also requires investigation in such populations.

The practical implications of this investigation suggest that mental imagery has emerged as a useful psychological skill for athletes who are visually impaired. In order to derive the most benefit from this skill, there is a need for mental imagery to become a more conscious process for such athletes, as imagery does not currently appear to be used to its full potential in this group. The current investigation has found that athletes who are visually impaired, along with being adept at using kinesthetic, tactile, and spatial images, do experience forms of visual imagery. Sport psychologists working with athletes with visual impairments should not ignore the role of visual imagery in the implementation of mental imagery interventions. What is more, encouraging athletes in this population to utilize all the possible sensory modalities of imagery may enhance the benefits of mental practice even further. The sole focus on visual imagery in the majority of existing investigations in sport psychology research may also account for the dominance of mental imagery use for cognitive-specific skill development. The four other types of imagery use proposed by Hall et al. (1998) should also be considered and adopted if athletes are to increase and fully develop the modalities that they use in their imagery experiences. Finally, it is also hoped that the emphasis placed upon the importance and benefits of kinesthetic, spatial, and tactile imagery in the present study encourages a shift away from a reliance on visual imagery commonly studied in sport psychology toward these and other modalities of the mental image.

References


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