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Imagery use by injured athletes: A qualitative analysis

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Abstract

The purpose of this study was to expand our knowledge and increase our understanding of imagery use by athletes in sport-injury rehabilitation using a qualitative approach. The participants were 10 injured athletes who were receiving physiotherapy at the time they were interviewed. During the interviews, the athletes provided extensive information about their use of imagery during injury rehabilitation and it was clear that they believed imagery served cognitive, motivational and healing purposes in effectively rehabilitating an injury. Cognitive imagery was used to learn and properly perform the rehabilitation exercises. They employed motivational imagery for goal setting (e.g. imagined being fully recovered) and to enhance mental toughness, help maintain concentration and foster a positive attitude. Imagery was used to manage pain. The methods they employed for controlling pain included using imagery to practise dealing with expected pain, using imagery as a distraction, imagining the pain dispersing, and using imagery to block the pain. With respect to what they imaged (i.e. the content of their imagery), they employed both visual and kinaesthetic imagery and their images tended to be positive and accurate. It was concluded that the implementation of imagery alongside physical rehabilitation should enhance the rehabilitation experience and, therefore, facilitate the recovery rates of injured athletes. Moreover, it was recommended that those responsible for the treatment of injured athletes (e.g. medical doctors, physiotherapists) should understand the benefits of imagery in athletic injury rehabilitation, since it is these practitioners who are in the best position to encourage injured athletes to use imagery.

Keywords: *Imagery use, injured athletes, qualitative analysis*

Introduction

The physically demanding nature of sports can generate the conditions for the incidence of injury, and consequently provides an arena for the examination of psychosocial techniques in preventing and treating these injuries. Thus, various researchers have discussed the use of psychological strategies in conjunction with sport-injury rehabilitation (e.g. Brewer, Jeffers, Petitpas, & Van Raalte, 1994; Cupal, 1998; Evans, Hardy, & Fleming, 2000; Gordon, Potter, & Ford, 1998). Some of the psychological strategies that have been considered include hypnosis, meditation, goal setting, self-talk and imagery.

We focus here on the use of imagery in athletic injury rehabilitation. Imagery is cognitively reproducing or visualizing an object, scene or sensation as though it were occurring in overt, physical reality. It evokes the physical characteristics of an absent object, event or activity that has been perceived in the past, or may take place in the future (Denis,

1985). Imagery can incorporate all five senses (i.e. vision, audition, olfaction, gustation and kinaesthetic; Vines, 1988).

The use of imagery by athletes has received considerable attention. In an in-depth examination of the nature of imagery use in sport, Munroe, Giacobbi, Hall and Weinberg (2000) considered four questions: Where do athletes use imagery? When do athletes use imagery? Why do athletes use imagery? What do athletes image? Research examining the “where” of athletes’ imagery reveals its use in primarily two contexts, competition and training, with imagery being used more often in conjunction with competition than with training (e.g. Salmon, Hall, & Haslam, 1994). Athletes also report using imagery outside of these two contexts, including at work, school and home (Salmon *et al.*, 1994), and during sport-injury rehabilitation (Sordoni, Hall, & Forwell, 2000, 2002).

With regard to the “when” of imagery use, it has been found that imagery is employed most often

immediately before a competitive event, rather than during or after competition (Barr & Hall, 1992). When athletes use imagery in training, they tend to use it during practice, not before or after practice (Salmon *et al.*, 1994). Outside of training and competition, athletes have reported using imagery intermittently throughout the day, but most often at night just before falling asleep (e.g. Rodgers, Hall, & Buckolz, 1991).

Paivio (1985) proposed that imagery can be used for both cognitive and motivational purposes, and each of these functions operates at specific and general levels (i.e. the “why” of imagery use). Within the sports context, the cognitive specific function of imagery entails the mental rehearsal of specific skills, while cognitive general imagery involves rehearsing various strategies and plans pertaining to sport. The motivational specific function of imagery involves imagining goals associated with sport. The motivational general function of imagery is further divided into two categories. The motivational general-arousal function involves imagery relating to the arousal, stress and anxiety of performing, while the motivational general-mastery function relates to images of being confident and mentally tough (Hall, Mack, Paivio, & Hausenblas, 1998). Various studies (for a review, see Martin, Moritz, & Hall, 1999) have demonstrated that imagery use by athletes can be classified according to these five functions.

The question of “what” athletes imagine has been addressed in several studies (e.g. Munroe *et al.*, 2000; White & Hardy, 1995), and refers to the content of an athlete’s image. Munroe *et al.* (2000) categorized the content of athletes’ images in sport under various headings. These headings included sessions (e.g. length of time athletes use imagery), effectiveness, surroundings, nature of imagery (i.e. positive or negative imagery, and the accuracy of the imagined event or behaviour) and type of imagery (e.g. visual, auditory).

As highlighted in the “where” of imagery use, athletes report using imagery during sport-injury rehabilitation (Sordoni *et al.*, 2000, 2002), and an examination of the imagery-injury research literature provides clues as to why injured athletes may use imagery. For example, Green (1992) has proposed that imagery can decrease the experience of stress associated with injury, and Hall (2001) postulated that imagery could be used to increase adherence to athletic injury rehabilitation programmes by producing mental toughness, increasing self-efficacy and controlling pain.

Studies investigating the use of imagery in athletic injury rehabilitation have sometimes examined the use of imagery in combination with other psychosocial variables. Cupal (1998) reviewed several such

studies. In this research, the use of imagery in conjunction with one or more other psychosocial variables successfully enhanced injured athletes’ experiences with rehabilitation. In addition, some of the studies found faster rates of recovery. Indeed, in a retrospective design, Ievleva and Orlick (1991) found that injured athletes who healed at a faster rate reported a greater use of the psychosocial strategies of goal setting, positive self-talk and imagery. Healing imagery (i.e. imagining physiological processes such as tissue mending itself) was found to be the most important function of imagery in producing faster recoveries.

To date, only a few studies have examined imagery in athletic injury rehabilitation independent of other variables. It has been suggested that in the context of rehabilitation, imagery may serve the same functions it serves in competition and training (e.g. Green, 1992). Accordingly, Sordoni *et al.* (2000) explored the cognitive (e.g. rehearsing rehabilitation exercises) and motivational (e.g. setting rehabilitation goals) functions of imagery in athletic injury rehabilitation while developing a tool to measure these functions (the Athletic Injury Imagery Questionnaire; AIIQ). Sordoni *et al.* (2000) found that injured athletes reported using both the motivational and cognitive functions of imagery, but to a lesser extent than in competition and training.

In a subsequent study, Sordoni *et al.* (2002) revised the AIIQ by adding items that represented healing imagery. The revised instrument (AIIQ-2) was administered to a sample of 217 injured athletes receiving physiotherapy. Results indicated that injured athletes used all three functions of imagery (cognitive, motivational and healing) to about the same extent and that the extent of imagery use was less than in training and competition. Also, in parallel with research on imagery use in sport (Barr & Hall, 1992; Salmon *et al.*, 1994), the injured athletes in this study who were involved in higher levels of competition (e.g. international competition) reported a greater use of both cognitive and motivational imagery than those competing recreationally.

While the research conducted by Sordoni and her colleagues (2000, 2002) has presented researchers with some initial insight into the use of imagery by injured athletes, the questionnaires used were not developed on the basis of exploratory empirical work, but on existing theoretical frameworks of athletes’ imagery use in training and competition. Thus, these questionnaires were not grounded in knowledge about actual imagery use by injured athletes. In the present study, we chose to employ a qualitative methodology to gain a more comprehensive understanding of injured athletes’ imagery use during rehabilitation.

Moreover, Patton (1990) has argued that the responses available on a questionnaire may be restrictive and perhaps may not accurately reflect the respondent's true thoughts, feelings and opinions. Also, a respondent might have additional information to offer, but the structured and specific nature of the questionnaire makes this supplementary information unattainable. A qualitative methodology overcomes some of these issues by allowing participants to respond using their "own written or spoken words and observable behaviours" (Bogdan & Taylor, 1984, p. 5). It produces extensive, descriptive data that is not possible to obtain when using quantitative methods.

Thus, the primary purpose of the present study was to qualitatively investigate imagery use by athletes in injury rehabilitation. By means of in-depth interviews, we attempted to answer four main questions that were similar to those originally posed by Munroe *et al.* (2000) in the context of competition and training. The questions included in the present investigation were: When do injured athletes use imagery? Where do they use imagery? Why do they use imagery? What are injured athletes imaging? To ensure the likelihood of substantial imagery use and hence improve the understanding of the nature of imagery used in athletic injury rehabilitation, we focused on competitive athletes rather than recreational athletes.

Methods

Participants

The participants were 10 injured athletes (8 males, 2 females) aged 18–38 years (21.7 ± 5.87 years; mean $\pm$ s), all of whom had provided informed consent before the start of the interviews. The athletes represented seven different sports: badminton ($n = 1$), track and field ($n = 3$), soccer ($n = 1$), American football ($n = 2$), wrestling ($n = 1$), arm wrestling ($n = 1$) and baseball ($n = 1$). They were competing at the following levels: high school ($n = 1$), varsity ($n = 3$), provincial ($n = 1$), national and international ($n = 3$), and professional ($n = 1$). The team sport players were all starters on their teams.

At the time of interview the participants had completed at least 2 weeks of physiotherapy for their current injury, and the length of rehabilitation completed ranged from 2 to 40 weeks (9.8 ± 11.5 weeks). The athletes' responses primarily concerned the rehabilitation of their current injury; however, several athletes also commented on their past injuries. The sample consisted of athletes with varying degrees of injury, ranging from a sprained ankle to a torn anterior cruciate ligament. A diverse

sample was chosen to help ensure that the full spectrum of imagery use was represented in the athletes' responses.

Interview guide development and pilot study

Four researchers experienced in qualitative inquiry were involved in the construction of the interview guide. The interview guide was developed based on the procedures sanctioned by several authors (i.e. Gould, Eklund, & Jackson, 1993; Hanton & Connaughton, 2002; Hanton & Jones, 1999). Open-ended questions were generated based on the findings and future research recommendations of Sordoni *et al.* (2000, 2002), and the literature on the four "W's" of imagery use (e.g. Munroe *et al.*, 2000). While Patton's (1990) recommendation of providing a standardized interview was followed to decrease the amount of bias that could occur if participants were asked different questions, to increase the flexibility of the interview the probes that were included and the sequencing of the questions were not as explicitly defined as in a purely standardized interview. [A copy of the finalized interview guide can be obtained from C.H.]

The interview guide consisted of three sections. The first section asked the injured athletes questions about their use of imagery in training and competition. The second section focused on the athletes' use of imagery in injury rehabilitation. This section began with questions relating to the "where" and "when" of imagery use, which were followed by questions pertaining to the "why" and "what" of imagery use. The final section provided the athletes with the opportunity to ask questions about the interview experience and to discuss any issues that may have been omitted.

Four pilot interviews with injured competitive athletes were then conducted. After each pilot interview, the interview guide was examined and refined according to feedback received from those interviewed and the observations made by the interviewer. The interview guide was again appraised by the same four researchers and finalized. The pilot interviews also served to help the interviewer (M.D.) fine-tune her interviewing skills.

Athletic Injury Imagery Questionnaire-2

The AIIQ-2 (Sordoni *et al.*, 2002) assesses an athlete's use of imagery during rehabilitation. An equal number of items representative of the motivational, cognitive and healing functions of imagery are included, plus questions relating the use of imagery in the management of their pain. An example of a motivational item is "I imagine myself achieving my treatment goals". An example of a cognitive item is

"Prior to performing a rehabilitation exercise, I am able to imagine myself completing it perfectly". An example of a healing item is "I imagine my body repairing itself". The participants rate their imagery use on a 9-point Likert scale from 1 ("never") to 9 ("always") indicating use of that particular function of imagery. Although the focus of the present study was qualitative, the AIIQ-2 was administered to provide some additional information and support for the qualitative analysis.

Procedures

The interviews were conducted face-to-face with the participants, by the first author, in a small meeting room. At the beginning of each interview, the participants were provided with a definition of imagery and completed the AIIQ-2. The interview guide was then followed. First, the athletes were asked to describe their use of imagery in training and competition. [Because of space restrictions and the fact that the participants' responses were similar to those reported in previous research (e.g. Munroe *et al.*, 2000), these results are not included here. However, they can be obtained from M.D.] Then a number of semi-structured, open-ended questions regarding the athletes' use of imagery in rehabilitation were posed. The interview ended with some general questions (e.g. describe any previous use of imagery in rehabilitation) and the collection of demographic information (e.g. age, type of injury, length of time in rehabilitation). The interviews were tape recorded and ranged in duration from 30 to 60 min. Discourse was subsequently transcribed verbatim, producing 105 pages of single-spaced text.

Data preparation and analysis

The transcribed interviews were formatted into text units that included one concept or idea for analysis by the QSR N4 program [this program is the fourth version of the Non-numerical Unstructured Data Indexing, Searching and Theorizing (NUD*IST) software for qualitative data analysis.]. The program stores, codes, retrieves and analyses text (Weitzman & Miles, 1995). The fundamental advantage of this program, in addition to organizing large amounts of data, is its ability to help the researcher explore relationships among the coded text (Fisher, 1997). Using a combination of inductive and deductive approaches (Patton, 1990), the text units were then indexed or coded and text units with comparable meanings were organized into specific categories. The QSR N4 program depicts the categories, or nodes, in the form of a hierarchical tree. The base of the tree is the most general level with the branches

representing the higher-order nodes. The initial tree was based on Munroe and colleagues' (2000) four "W's" of imagery framework; however, as recommended by Tesch (1990), the structure of the hierarchical tree remained flexible and was continually modified until it reached theoretical saturation. Miles and Huberman (1990) stated that theoretical saturation has been reached when the categorization of new data or text units fits adequately into the pre-existing framework. Two researchers conducted the analysis independently to ensure that the resulting classification system was suitable and best fit with the data. There was 98% agreement between the two researchers.

The current study met a number of the criteria proposed by Lincoln and Guba (1985) that are used to evaluate the trustworthiness of qualitative studies. Specifically, triangulation was achieved, since a number of researchers worked together to develop the interview guide and analyse the data. Thick description was employed to provide enough detail so that the reader has the opportunity to make his or her own interpretation of the data. Furthermore, member checking was employed with one participant.

Results

Where and when injured athletes use imagery

Athletes indicated using imagery less frequently in injury rehabilitation than in training and competition. The athletes gave accounts of using imagery outside of rehabilitation but for rehabilitation purposes. The most frequently cited places were at practice (when not participating), at home in bed and while driving. Using imagery when alone was also mentioned by several athletes.

In conjunction with rehabilitation, athletes indicated using imagery most often during their physiotherapy appointments rather than before or after. Imagery was employed for the most part just before completing a rehabilitation exercise. For example, a badminton player stated: "usually during physio ... immediately prior to doing an exercise".

Why injured athletes use imagery (functions)

Figure 1 provides an overview of why the injured athletes said they used imagery during rehabilitation.

Cognitive specific. The cognitive specific function of imagery is the rehearsal of specific movements, or rehabilitation exercises. Injured athletes indicated using imagery to help them perform specific rehabilitation movements before and while performing each rehabilitation exercise. Also, injured athletes

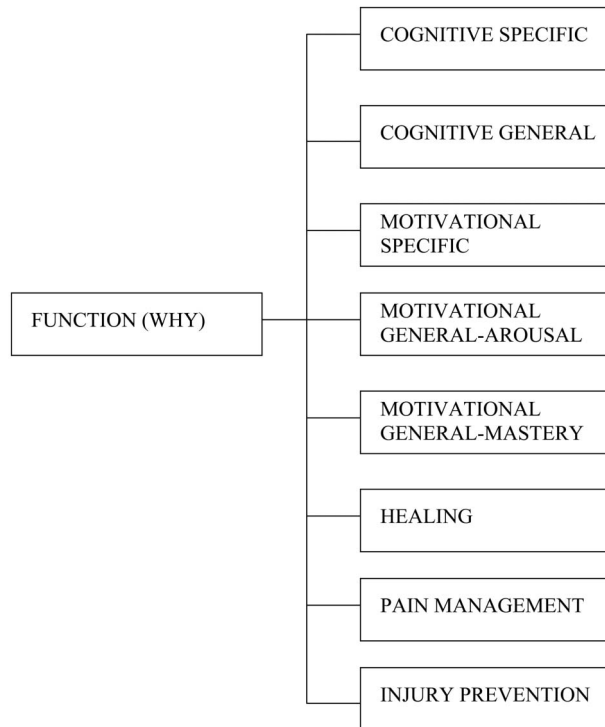


Figure 1. The functions served by injured athletes' imagery.

reported using imagery to help re-learn how to perform previously automated skills. This is apparent in a quote by an injured track athlete:

And, well, running is an exercise I do all the time and when I first started running it didn't really feel normal, and so I really had to really think in my head, okay, move this leg, move this arm and try to imagine myself doing this the right way and try to imagine what it felt like before I was injured.

Skill execution involves using imagery to enhance the performance of a skill. Once a rehabilitation exercise has been mastered, some injured athletes continued to use imagery. For example, one athlete said: "If I've already learned them then it just kind of goes over in my head before I go and do it. I just see myself doing it in my head before I go and do it".

Cognitive general. When undergoing injury rehabilitation, athletes did not report using cognitive general imagery for purposes directly related to the rehabilitation process. Rather, they used this function of imagery to maintain their ability to perform plays associated with their sport. A soccer player described using imagery during training sessions when unable to participate: "Um ...while I'm injured I still go to practice to keep me up to speed with what's going on. I can still see myself running the plays as if I was

healthy. So, I know where I'd be at for certain things".

Motivational specific. Athletes in the present study maintained that the motivational functions of imagery were the most important and most widely employed functions of imagery in conjunction with rehabilitation. The motivational specific function of imagery involves the visualization of goals and associated activities. Motivational specific imagery can be further divided into imagery of process and outcome goals. The former involves imagining the steps towards a goal. The athletes in this study often described using imagery to motivate themselves to do their rehabilitation exercises:

Well, for me, one is to motivate yourself to make yourself do all of these dumb little exercises that seem at the time that they are not helping you at all, but down the road they will. So, to try and keep things in perspective you kind of imagine how they're going to help you get back to competition level.

Athletes often reported imagining specific outcome goals. In rehabilitation, athletes consistently described images of themselves in the future, fully recovered, competing and winning.

Motivational general-arousal. Athletes undergoing rehabilitation discussed using imagery to help control the stress associated with being injured and unable to participate in their sport, and to facilitate relaxation. An example of the former includes: "As long as I have a mental routine and I picture that routine, then that kind of helps with my anxiety or my stress".

The motivational general-arousal function of imagery is also associated with feelings of excitement and can be used to help an athlete "psyche" up for activities. In rehabilitation, athletes gave accounts of using imagery to get them "fired up" to motivate themselves to continue their rehabilitation programme. An injured wrestler provided this example: "I'll think of a time when I got beat or something. Or just something that really gets me going ... And I just kind of used the fact that I wanted to get back and beat him".

Motivational general-mastery. Motivational general-mastery imagery is used to maintain focus, increase mental toughness and elicit feelings of self-confidence (self-efficacy). In rehabilitation, athletes indicated their use of imagery to help maintain focus. Injured athletes also reported using imagery to help them through difficult and even painful circumstances. For example, a football player reported

using motivational general-mastery imagery to help keep mentally tough:

Yeah, I had a high calf cramp for a while. And just kind of getting ready to do it perfectly I could kind of work through that just to keep the mental images, 'cause my first instinct when I felt the pain was to just stop and be like, okay, no. And I just kind of just worked through it and it just kind of goes away a little bit and then it comes back and goes away.

Athletes rarely reported using imagery in rehabilitation to increase their confidence or to help them maintain a positive attitude.

Healing. In addition to using cognitive and motivational imagery, athletes also reported using healing imagery. In using healing imagery to aid in the recovery process, athletes reported that most of their imagery entailed positive images of internal physiological processes. For example, a badminton player described employing imagery to aid in recovering from an ankle injury: "I would try to imagine what the tear looked like and I think about how it feels and how it's going to and try to think about how it's coming together while it's healing, or during the rehabilitation process".

Not only did the athletes envision the internal physiological processes taking place during recovery, they also reported imagining external aspects of recovery as well. For example, one athlete said: "I don't necessarily picture my ligament fixing ... I picture my strength and the external and just like as strong as I know it can be".

Most injured athletes reported using healing imagery while undergoing physiotherapy-related activities, such as icing. Athletes also reported using healing imagery at night, in bed:

When you're supposed to be sleeping, but you can't, or something like that. Um, well, sometimes a doctor will say, like you have to wait because the tunnels have to, the bone has to grow into the tunnels. This is kind of weird, but you can kind of imagine the bone actually growing and the tunnels filling up so there's no spaces there.

Pain management. The injured athletes described various methods of employing imagery to cope with pain. For example, some athletes used imagery to prepare for potentially painful situations, essentially practising coping with the pain. This method is expressed in a quote from an injured baseball player:

Oh, for sure. The pain is mental. You learn to deal with it. Especially with imagery you can, with

imagery you can give yourself situations where pain will arise and they sort of go hand in hand when you're doing it because by giving yourself situations where it will arise, or by constantly thinking of those situations, then it helps you deal with it when those times come.

Other athletes used imagery to distract themselves from experiencing the pain. In one instance, an injured track athlete tried to focus on positive aspects of the future:

But, while, like physio exercises right after surgery were really painful and you just try not to focus on the pain and you just try to imagine yourself in the future. And how good you're going to feel when you get through this and you're actually running and stuff like that.

Rather than distracting themselves, some athletes attempted to use their minds to block the pain, as shown by the following statement: "More so just stop thinking about the pain. I don't know if I go somewhere specifically. Like, I don't know if I really go to like a happy place, or anything. But, I kind of just stop ... like turn my mind off the pain".

The final method of using imagery to control pain is reflected in the following statement by an arm wrestler: "I just picture feeling better. I picture the pain going away, slowly". In this case, the athlete used imagery while receiving treatment; by visualizing the pain dispersing, the athlete was able to effectively control and conquer the pain being experienced.

Injury prevention. Athletes use imagery in rehabilitation to prevent the occurrence of injury, or avoid re-injury. For example, a baseball player stated: "Like I said, I imagine my limit, where I can push myself to without getting injured".

What injured athletes image (content)

While the functions of imagery refer to "why" athletes use imagery, the content of imagery refers to "what" athletes actually imagine. The content of injured athletes' imagery was categorized under five main headings as shown in Figure 2: sessions, effectiveness, nature, surroundings and type.

Sessions. When exploring what athletes imagine, it was common for them to discuss the duration of their imagery sessions. In rehabilitation, the athletes reported using imagery for periods lasting between 5 and 30 s. They also commented that the length of an imagery session varied depending on the task they were performing. An example was: "In rehab, just

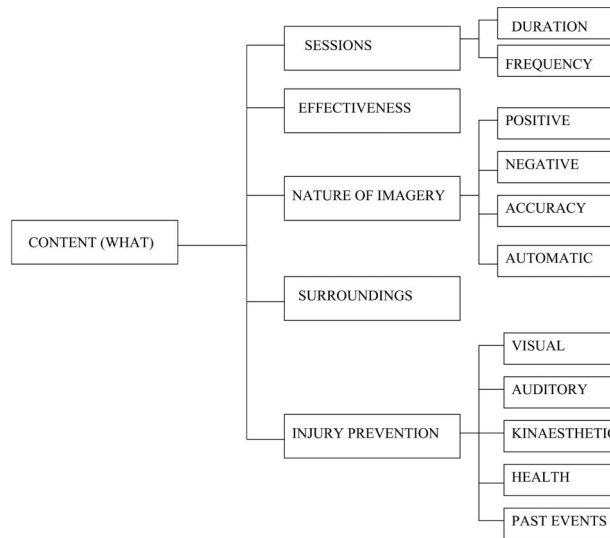


Figure 2. The content of injured athletes' imagery.

like 5 to 10 seconds before and then however long the exercise takes. So, I don't know, each one's different". Compared to training and competition, it was noted that the length of their imagery sessions, for the most part, were longer in rehabilitation.

Frequency reflects how often athletes make use of imagery. Most athletes maintained that their use of imagery in rehabilitation was less frequent than in training. Nonetheless, athletes reported using imagery at every physiotherapy appointment. For example, one athlete stated: "Every rehabilitation session you experience some for sure".

Effectiveness. Most athletes mentioned the effectiveness of using imagery specifically during rehabilitation, with one saying:

I think it's big. Especially just while doing the exercises and stuff because inevitably, well, especially after mine where I had the surgery and the muscles kind of went into atrophy ... I had to re-teach myself how to do things. And the only way I could do it, it's not like its just going to happen and you can't rely on that. Or, if you do then it's just going to take a lot longer. So, it's kind of the same thing as with weight training, if you visualize it before, then you'll progress a lot faster and you'll start to see better results.

Nature. The nature of imagery consisted, in part, of responses concerning positive and negative imagery. Despite their setbacks due to injury, the athletes constantly offered descriptions of positive imagery. Most athletes preferred to visualize themselves in the future, unaffected by the injury: "I try to focus on going back and I'll be at the same level and I'll be fine

and everything will be fine". However, not all images were positive. The athletes also described using negative imagery. They reported that sometimes it occurred unintentionally: "you don't want to imagine the worst outcomes, you know, but you, like, my life is over, I'm never going to be doing sports again, and stuff like that, but you do anyways, you just can't help it".

One athlete described using negative imagery in rehabilitation to help motivate returning to sport: "I imagine myself at practice and completely sucking and I don't. Or being horrible, or out of shape and I don't want that to happen, so it motivates me to do my exercises to get back in shape".

Within the nature of imagery, the data also revealed another sub-category designated automatic imagery. The athletes remarked on the automatic nature of their imagery use in rehabilitation. A heptathlete provided an example of this type of imagery: "It's not a conscious thing, really, for me. I know I'm doing it, but I really don't think about that I'm doing it". Some of the athletes reported, however, that imagery in rehabilitation was more purposeful than in training and competition. A track athlete expressed it as follows: "I would think less automatic in rehabilitation because the main reason you use it is for motivation. So, you're trying to make yourself think of all the positive things. But, sometimes it's automatic too, but not as often".

Surroundings. When visualizing themselves performing an exercise during a physiotherapy session, the athletes stated that they did not include aspects of their surroundings, such as their physiotherapist. For instance, a wrestler stated: "Um ... say, like I'm doing an exercise, I don't really imagine [name of physiotherapist] being there or anything, beside me". However, during their rehabilitation the athletes did report imagining their competition surroundings.

Type. Athletes mentioned the use of five different types of imagery in rehabilitation: visual, auditory, kinaesthetic, imagery of past events, and imagery of the athletes' health. Visual imagery was made up of the perspective taken by the athlete when using imagery (i.e. internal and/or external) and vividness of the image. A badminton player discussed the vividness: "And also when I think about myself, it's not like what I look like in the mirror, or anything. It's almost a stick man type of thing".

In rehabilitation, athletes only occasionally reported incorporating sound in their images. In contrast, kinaesthetic imagery was frequently discussed in conjunction with rehabilitation. The athletes' imagery regularly involved the feelings associated with various movements. Most athletes used kinaesthetic imagery before performing an

exercise to help remind themselves how to perform the movement and what the action felt like before they were injured. Kinaesthetic imagery was also used to equate the feelings associated with one action, in one environment, to the same action, in a different environment. A track athlete provided a description of employing kinaesthetic imagery:

It is more feeling. So, I feel it more. So, since it is the same kind of ... motions as if I was on the track, in the weight room, or in the pool. It's more just trying to get the same feeling and picture the same feeling and ... I use imagery that way more.

Injured athletes also reported using kinaesthetic imagery to remind themselves of how their body felt when it is in top form. They indicated using the image of this feeling to motivate themselves to return to pre-injury standards, exemplified by the following quote:

So, I picture how good my body felt, that day, like how good it felt when I was on the mound. I use that as the ideal benchmark of, like, how I could feel. You know, the warmness and certain areas feeling so loose, feeling so great. Like, I just, you know, slept for ... got all my sleep, nutrition, everything felt amazing and that's what I use. I image that, I picture that.

Athletes in rehabilitation reported imagining past experiences, movements or feelings to provide themselves with a guideline of what to expect. Also, injured athletes frequently commented on their health in their images. Most often, the athletes imagined themselves as healthy competitors. The following statement illustrates this finding: "So, I'd see myself as a healthy athlete on the track, not really as an athlete in pain". One athlete expressed thoughts of the potential consequences of imagining being unhealthy:

I think if I started imagining myself like doing a move, like as if I was hurt though, like if I started picturing stuff, but not doing it how I would do it if I was healthy, then I think it would either affect my wrestling, or it would maybe even injure me more. Just because I'd be afraid to do it the way I should do it.

AIQ-2 data summary

The means and standard deviations for each of the three imagery functions assessed by the AIQ-2 were: cognitive, 6.03 ± 1.95 ; motivational, 5.90 ± 1.18 ; healing, 5.63 ± 2.10 . These values are similar to

those found by Sordoni *et al.* (2000) and suggest that athletes use the three imagery functions to about the same extent during rehabilitation. The athletes experienced moderate amounts of pain (5.95 ± 2.65), and the athletes who reported using imagery to manage their pain rated it as quite effective (7.18 ± 1.23). In summary, these results indicate that the athletes used cognitive, motivational and healing imagery, had experience coping with pain, and used imagery to help effectively manage their pain. One additional finding was that the athletes rated their satisfaction with their overall rehabilitation programme as high (8.10 ± 1.20). Thus, these results provide some additional information not available from the qualitative findings described above. Furthermore, the qualitative data provide some content validation of the AIQ-2 by confirming that injured athletes use imagery for cognitive, motivational and healing functions, but also suggest that the AIQ-2 fails to assess other important functions of imagery, especially the use of imagery for pain management.

Discussion

The purpose of the present study was to enhance our knowledge and understanding of imagery use by athletes in sport-injury rehabilitation. During the interviews, the athletes provided extensive information about their use of imagery and it was clear that they believed imagery served many valuable roles in effectively rehabilitating an injury. This contrasts with other research (e.g. Francis, Andersen, & Maley, 2000) that found that athletes do not think imagery is a particularly useful tool in the recovery process.

Similar to athletes' reports of imagery use during practice (Salmon *et al.*, 1994), athletes undergoing rehabilitation in the present study consistently described using imagery mainly during their physiotherapy sessions, rather than before or after. Perhaps injured athletes equate physiotherapy with typical training regimes; therefore, their use of imagery is more salient during their appointments than at other times.

When the injured athletes in the present study were asked why they used imagery in rehabilitation, their responses reflected the three functions of imagery identified by Sordoni *et al.* (2002): cognitive, motivational and healing. Injured athletes in the present study frequently provided the interviewer with accounts of using cognitive specific imagery to rehearse their rehabilitation exercises to help enhance the learning of these exercises. They also reported using cognitive specific imagery to improve the performance of certain exercises that had already been mastered.

When cognitive general imagery was employed, the athletes reported imagining plays associated with their sport, rather than imagining strategies or plans pertaining to their rehabilitation programme. That is, they did not report employing cognitive general imagery as assessed by Sordoni *et al.* (2000, 2002) with the AIIQ-2. Why the injured athletes in the present study did not use cognitive general imagery for rehabilitation purposes is unknown, and given the differences in cognitive general imagery use between this study and those of Sordoni *et al.* (2000, 2002), further examination of the use of this function of imagery by injured athletes is necessary.

Consistent with the results of Sordoni *et al.* (2000), injured athletes in the present study reported that the motivational functions of imagery were the functions most frequently employed in conjunction with rehabilitation. In addition, injured athletes' reported use of motivational specific imagery corresponded with the categories of process and outcome imagery. Indeed, athletes report using motivational specific imagery to facilitate the setting of process goals in order to comply with rehabilitation instructions provided by their physiotherapists, and for the achievement of their outcome goals. For example, athletes imaged being fully recovered. These functions are consistent with suggestions that the motivational function of imagery may be useful to enhance adherence to physiotherapy (Martin *et al.*, 1999).

The athletes interviewed also reported the use of the motivational general-arousal function of imagery. Injured athletes used this function of imagery to help control anxiety, facilitate relaxation, and increase enthusiasm to execute their rehabilitation programme. Again, this motivational function of imagery may help to elicit optimal compliance with the rehabilitation programme, an important aspect of successful recovery.

Researchers have suggested that the motivational general-mastery function of imagery could be used in athletic injury rehabilitation to improve adherence by increasing mental toughness and self-efficacy, and helping to control pain (Martin *et al.*, 1999). It is not surprising, therefore, that the data from the present study indicated the use of motivational general-mastery imagery by injured athletes to enhance mental toughness and, to a lesser extent, self-efficacy. The athletes also reported the use of motivational general-mastery imagery to help maintain concentration and a positive attitude.

The use of healing imagery has been well documented in the medical literature (e.g. Alden, Dale, & DeGood, 2001; Gregerson, Roberts, & Amiri, 1996; Page, Levine, Sisto, & Johnston, 2001; Simonton, Simonton, & Creighton, 1984; Vines, 1988), but has not been extensively investigated in

the area of sport-injury rehabilitation. The injured athletes in the present study reported the use of healing imagery to aid in the recovery process. Specifically, the injured athletes described images of both internal and external physiological processes.

The present study extended the research of Sordoni *et al.* (2000, 2002), since the injured athletes reported using imagery for pain management. The methods they employed for controlling pain included using imagery to practise dealing with expected pain, using imagery as a distraction, imagining the pain dispersing, and using imagery to block the pain. Regardless of the method used, the athletes reported that the method they used was effective in helping them cope with the pain associated with their injury. Since the AIIQ-2 does not assess the use of imagery for pain management, a subscale reflecting this function of imagery should be added to the instrument.

This study further extended previous research (e.g. Sordoni *et al.*, 2000, 2002) with the finding that athletes reported using imagery before and during the execution of rehabilitation exercises to help control their technique so as to prevent future injury. This use of imagery to prevent injury may reflect the athletes' fear of re-injury (Ievleva & Orlick, 1991). Some of the athletes in the present study actually alluded to a fear of re-injury. This use of preventative imagery was reported by the athletes who had suffered a relatively severe injury (e.g. torn anterior cruciate ligament) and were undergoing considerable rehabilitation. Since previous studies have not focused on athletes with severe injuries, this may explain why previous research has not uncovered this use of imagery. If the AIIQ-2 is modified to include a pain management subscale as recommended above, it would be worthwhile adding an injury prevention subscale as well.

The results of the present study provided insight into the content of athletes' images in athletic injury rehabilitation. Injured athletes reported that the length of their imagery sessions varied in rehabilitation. They also reported that their imagery sessions were longer in rehabilitation than in training and competition. This may be because athletes have periods of time in which to use imagery during rehabilitation (e.g. while icing, while waiting for the physiotherapist) but they may not have similar breaks when they are training and competing.

Consistent with previous work by Sordoni and colleagues (2000, 2002), athletes in the present study reported using imagery less frequently in injury rehabilitation than in training and competition. However, they believed the imagery they used in rehabilitation was effective in helping them recover. One athlete even stated that his use of imagery was helping to speed up his rate of recovery.

Research has shown that the use of positive imagery enhances the performance of motor skills (Powell, 1973; Woolfolk, Parrish, & Murphy, 1985). Presumably, the use of positive imagery in rehabilitation provides a similar benefit. The majority of imagery described by the injured athletes was positive, but the use of negative imagery was reported. Some of the injured athletes indicated having what they considered to be negative images, such as their injury not healing as quickly as they would like. It has been suggested that negative images interfere with athletes using more positive images of successful healing (Ievleva & Orlick, 1991). However, some athletes in the present study described the use of negative images to motivate themselves to recover and return to pre-injury levels of fitness. Thus, these athletes used negative imagery to elicit positive behaviour. The athletes also reported that negative imagery sometimes occurred automatically. This automatic use of imagery was reported with other types of imagery as well. Several athletes, however, indicated that imagery in rehabilitation was generally less automatic than in training and competition. That their imagery was more purposeful in rehabilitation may partly explain why athletes reported longer imagery sessions in rehabilitation than in training and competition.

The situation-specific surroundings were rarely included in injured athletes' images. This is likely because the surroundings in rehabilitation are less relevant than in training and competition. Similar to training and competition, however, injured athletes reported using visual and kinaesthetic imagery more than any other type (e.g. auditory). Furthermore, the use of kinaesthetic imagery was reported more often than that of visual imagery in rehabilitation. This is probably because the athletes focus on how their injured muscles feel (e.g. pain, stiffness) as they exercise and attempt to achieve complete recovery.

Two components of imagery emerged that have not been reported in previous work. The first was the injured athletes' use of an image of a past experience or event to serve as a basis for how a skill should look and feel, to help them re-learn certain movements and skills. The second was the athletes often described including characteristics of their health in their images. How these two components of imagery actually impact athletes' rehabilitation (e.g. speed recovery, make the rehabilitation process more satisfying) should be investigated further.

The findings of the present study extend our knowledge and understanding of imagery use by injured athletes. However, there are many possibilities for further research. As already mentioned, the role of the cognitive general function of imagery in athletic injury rehabilitation needs to be assessed further. Also, future research must include more

thorough investigations of the motivational specific function of imagery as a facilitator in developing and carrying out specific rehabilitation goals, since athletes report considerable use of this function of imagery.

The use of healing imagery has only recently been examined in the athletic injury rehabilitation setting. While the injured athletes reported making use of this imagery function, there is no evidence of its effectiveness. Future studies need to determine if healing imagery can facilitate the recovery process. The current study was one of the first to explore athletes' use of imagery in the management of pain associated with injury and rehabilitation, and this topic also requires further investigation. Specifically, are some imagery techniques more effective than others in managing the pain related to athletic injury? Also, how does the degree of pain perceived by the athlete affect their use of imagery for this purpose?

The results of this study clearly indicate that injured athletes use imagery while undergoing rehabilitation. What is not known is whether they use imagery as effectively as possible and this warrants further examination. Nevertheless, it is important that those responsible for the treatment of injured athletes (e.g. medical doctors, physiotherapists) should understand the benefits of imagery in athletic injury rehabilitation, since it is these practitioners who are in the best position to encourage injured athletes to use imagery. Even given the limited research conducted to date, there is reason to believe that the implementation of imagery alongside physical rehabilitation may improve the success and recovery rates experienced by injured athletes.

References

- Alden, A. L., Dale, J. A., & DeGood, D. E. (2001). Interactive effects of the affect quality and directional focus of mental imagery on pain analgesia. *Applied Psychophysiology and Biofeedback*, 20, 117–126.
- Barr, K., & Hall, C. (1992). The use of imagery by rowers. *International Journal of Sport Psychology*, 23, 243–261.
- Bogdan, R., & Taylor, S. J. (1984). *Introduction to qualitative research methods: The search for meanings* (2nd edn.). Toronto, ON: Wiley.
- Brewer, B. W., Jeffers, K. E., Petitpas, A. J., & Van Raalte, J. L. (1994). Perceptions of psychological interventions in the context of sport injury rehabilitation. *The Sport Psychologist*, 8, 176–188.
- Cupal, D. D. (1998). Psychological interventions in sport injury prevention and rehabilitation. *Journal of Applied Sport Psychology*, 10, 103–123.
- Denis, M. (1985). Visual imagery and the use of mental practice in the development of motor skills. *Canadian Journal of Applied Sport Sciences*, 10, 4S–16S.
- Evans, L., Hardy, L., & Fleming, S. (2000). Intervention strategies with injured athletes: An action research study. *The Sport Psychologist*, 14, 188–206.

- Fisher, M. (1997). *Qualitative computing: Using software for qualitative data analysis*. Brookfield, VT: Ashgate Publishing.
- Francis, S. R., Andersen, M. B., & Maley, P. (2000). Physiotherapists' and male athletes' views on psychological skills for rehabilitation. *Journal of Science and Medicine in Sport*, 3, 17–29.
- Gordon, S., Potter, M., & Ford, I. (1998). Toward a psychoeducational curriculum for training sport-injury rehabilitation personnel. *Journal of Applied Sport Psychology*, 10, 140–156.
- Gould, D., Eklund, R. C., & Jackson, S. A. (1993). Coping strategies used by U.S. Olympic wrestlers. *Research Quarterly for Exercise and Sport*, 64, 83–93.
- Green, L. (1992). The use of imagery in the rehabilitation of injured athletes. *The Sport Psychologist*, 6, 416–428.
- Gregerson, M. B., Roberts, I. M., & Amiri, M. M. (1996). Absorption and imagery locate immune responses in the body. *Biofeedback and Self-Regulation*, 21, 149–165.
- Hall, C. (2001). Imagery in sport and exercise. In R. Singer, H. Hausenblas, & C. Janelle (Eds.), *Handbook of sport psychology* (2nd edn., pp. 529–549). New York: Wiley.
- Hall, C., Mack, D., Paivio, A., & Hausenblas, H. (1998). Imagery use by athletes: Development of the Sport Imagery Questionnaire. *International Journal of Sport Psychology*, 29, 73–89.
- Hanton, S., & Connaughton, D. (2002). Perceived control of anxiety and its relationship to self-confidence and performance: A qualitative inquiry. *Research Quarterly for Exercise and Sport*, 73, 87–97.
- Hanton, S., & Jones, G. (1999). The acquisition and development of cognitive skills and strategies. I: Making the butterflies fly in formation. *The Sport Psychologist*, 13, 1–21.
- Ievleva, L., & Orlick, T. (1991). Mental links to enhanced healing: An exploratory study. *The Sport Psychologist*, 5, 25–40.
- Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry*. Thousand Oaks, CA: Sage.
- Martin, K. A., Moritz, S. E., & Hall, C. R. (1999). Imagery use in sport: A literature review and applied model. *The Sport Psychologist*, 13, 245–268.
- Miles, M., & Huberman, A. (1990). *Qualitative data analysis: A sourcebook of new methods*. Newbury Park, CA: Sage.
- Munroe, K., Giacobbi, P., Hall, C., & Weinberg, R. (2000). The four w's of imagery use: Where, when, why, and what. *The Sport Psychologist*, 14, 119–137.
- Page, S. J., Levine, P., Sisto, S., & Johnston, M. V. (2001). A randomized efficacy and feasibility study of imagery in acute stroke. *Clinical Rehabilitation*, 15, 233–240.
- Paivio, A. (1985). Cognitive and motivational functions of imagery in human performance. *Canadian Journal of Applied Sport Sciences*, 10, 22S–28S.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods*. Newbury, CA: Sage.
- Powell, G. E. (1973). Negative and positive mental practice in motor skill acquisition. *Perceptual and Motor Skills*, 37, 312.
- Rodgers, W., Hall, C., & Buckolz, E. (1991). The effect of an imagery training program on imagery ability, imagery use, and figure skating performance. *Journal of Applied Sport Psychology*, 3, 109–125.
- Salmon, J., Hall, C., & Haslam, I. (1994). The use of imagery by soccer players. *Journal of Applied Sport Psychology*, 6, 116–133.
- Simonton, C., Simonton, S. M., & Creighton, J. L. (1984). *Getting well again*. New York: Bantam Books.
- Sordoni, C., Hall, C., & Forwell, L. (2000). The use of imagery by athletes during injury rehabilitation. *Journal of Sport Rehabilitation*, 9, 329–338.
- Sordoni, C., Hall, C., & Forwell, L. (2002). The use of imagery in athletic injury rehabilitation and its relationship to self-efficacy. *Physiotherapy Canada*, Summer, pp. 177–185.
- Tesch, R. (1990). *Qualitative research analysis types and software tools*. New York: Falmer Press.
- Vines, S. W. (1988). The therapeutics of guided imagery. *Holistic Nursing Practice*, 2, 34–44.
- Weitzman, E., & Miles, M. (1995). *Computer programs for qualitative data analysis: A software sourcebook*. Thousand Oaks, CA: Sage.
- White, A., & Hardy, L. (1995). Use of different imagery perspectives on the learning and performance of different motor skills. *British Journal of Psychology*, 86, 169–180.
- Woolfolk, R. L., Parrish, M. W., & Murphy, S. M. (1985). The effects of positive and negative imagery on motor skill performance. *Cognitive Therapy and Research*, 9, 335–341.