The Use of Imagery by Athletes During Injury Rehabilitation

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Objectives: To determine whether athletes use motivational and cognitive imagery during injury rehabilitation and to develop an instrument for measuring imagery use.

Design: A survey concerning imagery use during rehabilitation was administered to injured athletes.

Setting: The Fowler Kennedy Sport Medicine Clinic in London, Ontario, Canada.

Participants: Injured athletes (N = 71) receiving physiotherapy.

Main Outcome Measure: The Athletic Injury Imagery Questionnaire (AIIQ).

Results: As hypothesized, 2 distinct factors emerged from the items on the AIIQ: motivational and cognitive imagery. Motivational imagery was used more often than cognitive imagery in this context, yet less frequently than in other sport situations (eg, training and competition).

Conclusions: The study indicates that the AIIQ is a potentially useful tool through which physiotherapists and sport psychologists can examine athletes’ use of imagery in injury rehabilitation.

Key Words: cognitive, motivation


Imagery serves 2 roles in sport: a motivational role and a cognitive one. Each operates at 2 levels—general and specific—with most imagery research focusing on the cognitive function of imagery in sport. Cognitive-general imagery is concerned with imaging general strategies of play, whereas cognitive-specific imagery involves imaging specific skills. Thus, a football player using cognitive-general imagery might imagine himself practicing various game plans, and a diver using cognitive-specific imagery might image herself perfectly performing a certain dive. Motivational-specific imagery is concerned primarily with goal-oriented responses, whereas motivational-general imagery involves the arousal and affect that are associated with performing. For example, a competitive swimmer might image herself winning the 100-m freestyle (motivational-specific imagery)
and the feelings of arousal associated with this victory (motivational-general imagery). Motivational imagery is used more often in competition than in training\(^2\) and has been shown to be helpful in building self-confidence\(^5\) and regulating levels of arousal and anxiety.\(^5,6\)

Although imagery has been shown to serve both motivational and cognitive functions in training and competition, it is not known whether it serves the same functions in injury rehabilitation. Therefore, the primary purposes of the present study were to determine whether athletes use both motivational and cognitive imagery during injury rehabilitation and to develop an instrument for measuring their use of imagery in this context.

Imagery has been investigated most often in the context of training. For example, Blair, Hall, and Leyshon\(^4\) examined the use of cognitive imagery by female novice and elite soccer players in training. Athletes at both skill levels were divided into 2 groups (control and treatment) and taught a difficult task consisting of dribbling, passing, shooting, and checking off. Athletes in the treatment groups were instructed to imagine the criterion task, and those in the control groups worked on developing a competitive strategy. Both treatment and control groups engaged in regular physical practice. After 6 weeks, those in the treatment groups (both novice and elite) had significantly lower response times on the task than those in the control groups did. These findings suggest that imagery was effective in helping both novice and elite players learn the task.

Studies have shown that the level at which an athlete competes influences the amount of imagery that he or she uses. Those competing at higher levels of competition typically use more imagery than their less elite counterparts do in a variety of sports such as soccer,\(^7\) rowing,\(^8\) football, hockey, soccer, squash, gymnastics, and figure skating.\(^9\) One variable that does not appear to significantly influence imagery use is gender.\(^9\)

Athletes' use of imagery in training and competition has been extensively examined,\(^1,9\) but their imagery use during injury rehabilitation has not been systemically investigated, although some researchers have hypothesized about how imagery might influence the rehabilitation process. Schwartz\(^10\) suggests that humans are systems in which there is a constant interchange between one's mental and physiological functions. Thus, an appropriate physiological change occurs in the body for every alteration in the individual's mental state, and in order for treatment to be effective and for full recovery to occur, the body and the mind must work together.\(^11\) Imagery is 1 psychological intervention strategy that focuses on this principle.

Korn\(^12\) has suggested that, once injury has occurred, imagery can be used to increase relaxation, decrease anxiety, manage depression, increase self-confidence, increase motivation, and relieve pain. Such images can facilitate the athletes' obtaining the mindset required for a return to optimal levels of performance, as well as helping bring closure to the entire injury experience.\(^11\)
It has been established that athletes who are injured can have any of a number of psychological responses to their injury. This makes it necessary to include both physical and psychological therapies as part of the injury-rehabilitation program. Imagery has been shown to serve both motivational and cognitive functions in training and competition; however, whether imagery serves the same functions in injury rehabilitation has yet to be determined. Exploring the use of imagery by athletes as part of their rehabilitation regimen might provide valuable knowledge to physiotherapists, athletes, coaches, trainers, and sport psychologists, alike.

In determining whether athletes use both motivational and cognitive imagery during injury rehabilitation, 3 hypotheses were examined in the present study, based on previous findings for training and competition. First, it was hypothesized that athletes would use both motivational and cognitive imagery during injury rehabilitation, but motivational imagery would be used more than cognitive imagery. Second, it was believed that athletes competing at higher levels of competition would use more imagery during their rehabilitation. Finally, it was expected that athletes who had used imagery previously would be more likely to incorporate it in their treatment regimens.

Method

Participants

Seventy-one athletes, 62% men (n = 44) and 38% women (n = 27), receiving physiotherapy treatment at the Fowler Kennedy Sport Medicine Clinic in London, Ontario, participated in the study. These athletes had attended a minimum of 5 physiotherapy appointments to ensure that each had had the opportunity to implement any imagery strategies.

The athletes competed in 19 different sports: 56% in team sports (hockey and basketball were most commonly cited) and 44% in individual sports (track and field was noted most often). They ranged in age from 18 to 64 years (mean = 28.14, SD = 11.67), and most had participated in their respective sports for many years (mean = 12.84, SD = 9.24). They competed at various levels, with 42% being recreational athletes and 58% being competitive athletes (e.g., participating at a regional, provincial, national, international, or varsity level).

Measures

A survey concerning the use of imagery during athletic injury rehabilitation was developed specifically for the present study. The survey was a self-report instrument in which all questions are answered retrospectively. It consisted of 3 parts. Part A included demographic and background information including gender, age, sport, and level of competition. Other
injury-specific items were included, such as information regarding previous injuries sustained in sport (e.g., location of injury and circumstances through which it occurred) and current injury information (e.g., length of rehabilitation, location of injury, severity of injury). Responses in Part A were answered using an open-ended format (e.g., “Under what circumstances did your present injury occur?”), as well as on a Likert-type 7-point rating scale (e.g., “How severe did you perceive your present injury as being at the time that the injury occurred?”).

Part B was the Athletic Injury Imagery Questionnaire (AIIQ), and the items included on it examined the injured athlete’s current use of imagery. Items are representative of both motivational and cognitive imagery. An example of a motivational item is “I imagine myself achieving my treatment goals,” whereas an example of a cognitive item is “I imagine each rehabilitation exercise.” All items are rated on a 7-point Likert scale on which 1 represents never and 7 indicates frequent use of that particular function of imagery during the athlete’s injury rehabilitation regimen.

Items on the AIIQ representing the motivational and cognitive functions of imagery were developed based on a review of the literature and an examination of the Sport Imagery Questionnaire developed by Hall and colleagues. Care was taken to ensure that there was the same number of motivational and cognitive items so that biases in item generation would not influence the results. The content validity of this pool of items was assessed by 2 research experts, as well as the content, format, and wording of the items.

Part C was designed to explore how the athletes’ previous use of imagery in sport was related to their current use of imagery as part of their respective rehabilitation regimens. Answers were again scored on a 7-point Likert scale, with 1 indicating never using imagery before the current injury and 7 indicating frequent previous use of imagery. Questions involving how much imagery was used at various times in the rehabilitation of the current injury were also included in this section (e.g., “Rate the extent to which you used imagery at the beginning of your rehabilitation”) and were again answered on a similar 7-point Likert scale.

Procedure

The study was conducted at 2 locations of the Fowler Kennedy Sport Medicine Clinic: 1 at The University of Western Ontario and the other at Galleria Mall (a shopping center), both in London, Ontario. The survey was distributed by either the researcher or the athlete’s physiotherapist. Participants who chose to complete the questionnaire at the time of their appointment were given a consent form, and, once permission was obtained, the survey and a debriefing form. Participants who chose to complete the survey at a later time were asked to either bring the consent form and survey back to the clinic at their next appointment or to send the completed questionnaire.
to the researcher in the self-addressed, stamped envelope provided. The survey took approximately 10 minutes to complete. The physiotherapists did not give the injured athletes any instructions or suggestions with respect to the use of imagery.

Data Analysis

A principal-components factor analysis was conducted to determine whether the items on the AIIQ formed 2 coherent subsets (ie, cognitive and motivational imagery) that were relatively independent of one another, as hypothesized. Maximum-likelihood factor extraction with varimax rotation was employed to ensure that the factors (ie, types of imagery) were kept independent of one another. The resulting factor loadings were interpreted according to Tabachnick and Fidell.\footnote{14} The greater the loading, the more the item is a pure measure of the factor. A factor loading exceeding .45 is considered good; therefore, this criterion level was adopted in the present study for items loading on a factor.

The internal consistency of the items making up each imagery factor was evaluated using Cronbach alpha. This measure indicates whether a factor is well defined by the items it contains. Values can range from 0 to 1, and a high value indicates that a factor is well defined. The criterion level for the definition of a factor was set at an alpha coefficient of .70. Descriptive statistics were calculated for each imagery factor, and correlational analyses were conducted to determine whether any variables assessed in parts A and C of the survey were related to imagery use during rehabilitation.

Results

Results of the factor analysis revealed 2 factors, 1 reflecting motivational imagery and the other representing cognitive imagery (see Table 1). The internal consistency of the items measuring each imagery factor was then evaluated using Cronbach alpha. Both imagery factors had acceptable reliability coefficients: motivation = .73, and cognitive = .84.

The means for each of the 2 imagery factors were lower than those typically reported by athletes for their use of motivational and cognitive imagery in sport (see Table 2). These results indicate that athletes are less likely to use motivational and cognitive imagery in injury rehabilitation than in other sport situations (eg, training, competition). With respect to the demographic information collected in part A of the survey, the typical trends found in previous research\footnote{7,9} were again evident. Competitive athletes reported using imagery more than recreational athletes did, and men and women reported using imagery to about the same extent.

Correlation analyses revealed that cognitive use of imagery during injury rehabilitation was significantly related to the previous use of imagery in training and competition, and both motivational and cognitive imagery
Table 1  Imagery Questionnaire Items and Factor Loadings*

<table>
<thead>
<tr>
<th>Item</th>
<th>Motivation</th>
<th>Cognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>I imagine myself being self-confident when performing my rehabilitation exercises.</td>
<td>.79</td>
<td>.01</td>
</tr>
<tr>
<td>I imagine myself working successfully through tough situations (e.g., slower than expected recovery, further injury).</td>
<td>.71</td>
<td>.11</td>
</tr>
<tr>
<td>I imagine myself achieving my treatment goals.</td>
<td>.70</td>
<td>.30</td>
</tr>
<tr>
<td>I imagine myself training at the level I did prior to the injury.</td>
<td>.59</td>
<td>.33</td>
</tr>
<tr>
<td>I imagine myself in competition, competing at the level I did prior to becoming injured.</td>
<td>.52</td>
<td>.02</td>
</tr>
</tbody>
</table>

**Motivation**

If progress did not go as well as expected in my rehabilitation, I was able to imagine alternative strategies. .10 .83

Prior to performing a rehabilitation exercise, I was able to imagine myself completing it perfectly. .33 .78

I was able to imagine new rehabilitation plans and strategies in my head if they were prescribed to me. .17 .77

I imagined each rehabilitation exercise. .34 .71

I was able to change the image of a particular rehabilitation skill or exercise if necessary. .07 .65

Cognitive

*Each factor loading indicates the proportion of each item's variance that can be attributed to that particular function of imagery. Thus, questionnaire items loading highly on the motivational factor measure motivational imagery; similarly, questionnaire items loading highly on the cognitive factor measure cognitive imagery.

... were significantly correlated with the previous use of imagery in rehabilitation (see Table 3). In contrast, the use of imagery during rehabilitation was not significantly related to competitive level, proximity of the next competition, number of weeks spent in rehabilitation, or change in duration and intensity of training after injury.

**Comments**

The results of the present study indicate that imagery plays both a motivational and a cognitive role in injury rehabilitation, just as it does in training and competition. The findings suggest that athletes' use of imagery during
### Table 2  Comparison of the Motivational and Cognitive Use of Imagery in Rehabilitation and Sport*

<table>
<thead>
<tr>
<th>Situation</th>
<th>Source</th>
<th>Motivation</th>
<th>Cognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehabilitation</td>
<td>Present study</td>
<td>4.81 (1.82)</td>
<td>3.37 (1.75)</td>
</tr>
<tr>
<td>Training and competition</td>
<td>Salmon, Hall, Haslam^7</td>
<td>5.62 (0.93)</td>
<td>4.95 (0.78)</td>
</tr>
<tr>
<td>Competition</td>
<td>Moritz, Hall, Martin, Vadocz^5</td>
<td>5.81 (0.80)</td>
<td>4.23 (0.92)</td>
</tr>
<tr>
<td>Training and competition</td>
<td>Munroe, Hall, Simms, Weinberg^15</td>
<td>5.23 (1.07)</td>
<td>5.08 (0.94)</td>
</tr>
</tbody>
</table>

*Values are mean scores on 7-point Likert scale on which 1 represents never and 7 indicates the frequent use of that particular function of imagery; values in brackets are SDs.

### Table 3  Variables Related to the Use of Imagery During Rehabilitation*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Motivation</th>
<th>Cognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous use of imagery in training</td>
<td>.00</td>
<td>.29†</td>
</tr>
<tr>
<td>Previous use of imagery in competition</td>
<td>.00</td>
<td>.36†</td>
</tr>
<tr>
<td>Previous use of imagery in injury rehabilitation</td>
<td>.51‡</td>
<td>.79‡</td>
</tr>
</tbody>
</table>

*Previous use of imagery in training, competition, and injury rehabilitation is correlated with current use of cognitive imagery in injury rehabilitation, and previous use of motivational imagery in injury rehabilitation is significantly correlated with motivational imagery in current rehabilitation regimens.

†Significant correlation: $P < .01$.

‡Significant correlation $P < .001$.

Injury rehabilitation is consistent with their use of imagery in other aspects of sport (e.g., training, competition); however, athletes tend to use imagery less frequently in the context of injury rehabilitation. Because athletes employ imagery extensively in training and competition,^7,9^ and using imagery has numerous benefits^3^ (e.g., enhancing performance, increasing self-confidence, controlling anxiety and arousal), it seems that athletes fail to fully transfer their use of imagery in training and competition to injury rehabilitation. Therefore, athletes need to be reminded and encouraged to use imagery during injury rehabilitation.

Previously, athletes have been found to use imagery more for its motivational function than for its cognitive function, especially in competition.^7,9^ Particularly at the elite level of sport, getting a psychological edge over an opponent often determines who will win. In this way, imagery has been found to facilitate maintaining appropriate arousal and stress levels,
increase athletes’ self-confidence, and help them set realistic goals. We propose that motivational imagery in the context of injury rehabilitation operates through the same mechanisms that it does in competition. That is, imagery use during rehabilitation can help athletes control arousal and stress levels, improve self-confidence, and set appropriate goals.

As mentioned previously, cognitive imagery is used extensively by athletes in training to help perfect specific skills (cognitive-specific) and strategies (cognitive-general). Blair and colleagues found that elite and novice soccer players who used cognitive imagery in training performed better on a difficult soccer task than did athletes in a control group. However, the results of the present study indicate that imaging rehabilitation skills and strategies are not employed very often by injured athletes. This might result from a number of factors. First, it might be that the prescribed exercises are not difficult enough to warrant the extensive use of such imagery. Second, the athletes might not view the rehabilitation exercises as “skills” in the same way as they view their athletic activities. This dissociation between their sporting life and other aspects of their life, including their rehabilitation activities, might account for their differing approaches to training and rehabilitation. Third, the problem of nonadherence to injury-rehabilitation regimens has continually been reported by athletic trainers, coaches, sport psychologists, and physiotherapists. Thus, it might be that athletes are not imagining prescribed skills and strategies because they are not practicing them. Given that adherence to rehabilitation is critical to an injured athlete’s ability to return to competition and that the use of cognitive imagery should be beneficial, further research investigating the reasons that injured athletes are not making more extensive use of cognitive imagery is warranted.

Although empirical research in this area is sparse, the results of the present study support some of the proposals that researchers have made concerning athletes’ use of imagery during injury rehabilitation. Korn suggested that motivational imagery is employed to increase relaxation, decrease anxiety, aid in managing depression, increase self-confidence, increase motivation, and relieve pain. Ievleva and Orlick found that motivational imagery helped increase injured athletes’ levels of self-efficacy by increasing their feelings of personal control, especially when dealing with stress; ultimately, use of motivational imagery was associated with a more rapid return to competition. Therefore, it is not surprising that motivational imagery was used extensively by the athletes in the present study.

The previously cited use of imagery in training, competition, and injury-rehabilitation situations was associated with increased use of imagery during the athletes’ current rehabilitation. This finding suggests that athletes, to some extent, generalize their use of imagery to all aspects of sport. Other variables, however, were not related to imagery use during rehabilitation. The athletes who had suffered from previous injuries did not use significantly more motivational and cognitive imagery than those who had not.
In addition, athletes who were expecting to compete at a competitive level at their next competition did not use significantly more imagery during their rehabilitation than did athletes who expected to compete recreationally.

The present preliminary analyses indicate that the AIIQ is a useful tool for examining athletes’ use of imagery during injury rehabilitation; however, future studies should include more subjects both to confirm the factor structure of the questionnaire and to replicate some of the present findings. In addition, the use of healing imagery in athletic injury rehabilitation should be explored, because this was not addressed in the present study. Athletes in injury rehabilitation might find that imaging the physiological repairing of their injury facilitates their recovery.

Additional relationships can also be explored using the AIIQ. Research has shown that imagery use in sport is associated with increased self-confidence and regulation of anxiety.\textsuperscript{5,6} Similar relationships between imagery use and these variables might exist in the injury-rehabilitation context. Also, the point in the season at which the injury occurs should be examined to see how it relates to use of imagery during injury rehabilitation. Finally, and probably most important, studies should be conducted to determine whether use of imagery does, in fact, lead to more rapid recovery from athletic injuries. The AIIQ could be used prospectively in these studies, with athletes practicing imagery as part of their rehabilitation being compared with a control group not using imagery. Findings from such studies would certainly have great utility for both physiotherapists and sport psychologists.

References


