Self-Efficacy, Imagery Use, and Adherence to Rehabilitation by Injured Athletes

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Objective: To evaluate the factorial validity of the Athletic Injury Self-Efficacy Questionnaire (AISEQ) and the predictive relationships among self-efficacy, imagery use, and rehabilitation adherence. Design and Setting: Survey administered in an outpatient physiotherapy clinic. Participants: 270 injured athletes. Main Outcome Measures: AISEQ, Athletic Injury Imagery Questionnaire, and an adherence measure. Results: A confirmatory factor analysis of the AISEQ revealed a 2-factor model. Athletes were higher in task efficacy than coping efficacy and used more cognitive and motivational imagery than healing imagery. In addition, athletes rated their frequency and duration of exercise performance higher than their quality of exercise performance. Cognitive imagery significantly predicted task efficacy, task efficacy predicted quality of exercise, and coping efficacy predicted frequency of exercise. Both task and coping efficacy were predictors of duration of exercise. Conclusions: Results support a 2-factor solution of the AISEQ. In addition, task and coping self-efficacy appear to be key aspects in rehabilitation adherence. Key Words: sport, psychological skills, athletic injury

Injuries play pivotal roles in the careers of athletes by causing both physical and psychological damage. These events commonly lead athletes to question their ability to fully recover. Successful athletic injury rehabilitation is enhanced through proper adherence to a prescribed rehabilitation program. Although one might assume that an athlete would be extremely motivated to follow treatment in order to recover and return to competition as quickly as possible, studies have revealed that rehabilitation nonadherence rates are in the range of 30% to 70%. It has been suggested that injury interpretation and rehabilitation-outcome expectancies of an injured athlete might play a role in rehabilitation-program adherence. In addition, athletes’ program adherence might be affected by scheduling and environmental and personal conditions (pain, self-motivation). Nonetheless, these dismal rates have
piqued the interest of both researchers and health-care professionals, and it has been suggested that program interventions be designed in order to help increase rehabilitation adherence rates.²

Psychological strategies employed thus far in an attempt to increase injury-rehabilitation adherence have included hypnosis, meditation, goal setting, and self-talk.³⁻¹⁰ These variables have been reported to positively influence adherence, enhance motivation, control anxiety, and increase self-confidence or self-efficacy.¹¹ The role of self-efficacy and the use of imagery in athletic injury rehabilitation have only recently been examined and were the focus of the present research.¹²,¹³

Self-efficacy is defined as one’s belief in one’s performance capabilities with respect to a specific task and is seen to play an essential and prominent role in various aspects of human behavior.¹⁴ Self-efficacy has received extensive consideration in sport-psychology research and has been shown to be a significant predictor of motivation¹⁵ and athletic performance.¹⁶,¹⁷ In rehabilitation, higher levels of self-efficacy have been linked to increases in pain tolerance and pain control.¹⁸,¹⁹

Three distinct types of self-efficacy (task, barrier, and scheduling) have been examined in the exercise-psychology literature²⁰⁻²² and might prove to be relevant in athletic injury rehabilitation. Task efficacy entails judgments about capabilities in a specific situational context. Barrier efficacy is a belief in the capability to overcome social, personal, and environmental constraints, and scheduling efficacy concerns the ability to schedule or plan strategies for carrying out exercises. Because barrier and scheduling self-efficacy are both considered self-regulatory in nature,¹⁴ they have been classified as subtypes of coping self-efficacy.²³,²⁴ Rodgers et al²⁵ examined task and coping efficacy in regard to predicting exercise behavior. They found that task self-efficacy influenced behavioral intention and the initiation of activity, whereas coping self-efficacy influenced the maintenance of exercise behavior. Although both are involved in motivation, these different types of self-efficacy potentially perform different motivational roles. From an injury-rehabilitation perspective, task and coping self-efficacy might play a vital role in an individual’s situational perspectives, motivation to recover, and subsequent adherence to a prescribed rehabilitation program.

One variable often investigated in conjunction with self-efficacy in physical activity contexts is mental imagery. In sport it has been determined that imagery serves 2 functions, cognitive and motivational, and these 2 functions operate at a specific or general level.²⁶ The cognitive function involves the rehearsal of skills (cognitive specific imagery) and strategies of play (cognitive general imagery). The motivational function involves imagining goals and the activities necessary to achieve them (motivational specific imagery) and images pertaining to general physiological arousal and affect (motivational general imagery).²⁷ Sordoni et al¹²,¹³ proposed that in injury rehabilitation, cognitive imagery is used to rehearse rehabilitation
exercises, and motivational imagery is used to control arousal and increase self-confidence. In addition to these 2 functions, imagery can also serve a healing function. This healing function entails imagining the physiological processes taking place during rehabilitation (eg, tissue or bone mending). Despite its widespread use in sport, imagery is used considerably less by athletes when they are injured. The use of imagery in an athletic rehabilitation setting is undoubtedly beneficial, however. Imagery use has been documented as an effective tool in managing pain and promoting recovery from disease and various illnesses. In addition, in a review examining psychological factors and healing, Ievleva and Orlick found that the individuals who healed most quickly used more imagery techniques, which resulted in greater feelings of self-control.

Sordoni et al undertook one of the first empirical investigations of the use of both imagery and self-efficacy by athletes during injury rehabilitation. The Athletic Injury Questionnaire (AIQ-2) and the Athletic Injury Self-Efficacy Questionnaire (AISEQ) were administered to 217 athletes attending physiotherapy. Although it was hypothesized that imagery, especially motivational imagery, would be correlated with self-efficacy, it was found that only healing imagery was significantly related to self-efficacy. With respect to the AISEQ, an exploratory factor analysis supported a 1-factor solution, indicating that injured athletes do not distinguish among the various types of self-efficacy (ie, task, barrier, and scheduling). The overall aim of the present research was to reexamine and extend this work by Sordoni and colleagues.

Study 1

Exercise psychologists have distinguished 3 types of self-efficacy: task, barrier, and scheduling. Furthermore, these types of self-efficacy differentially influence behavioral intention and exercise behavior. Despite these findings, when Sordoni et al undertook an exploratory factor analysis of a measure, the AISEQ, that was developed to assess these types of self-efficacy in athletic injury rehabilitation, they found a 1-factor solution, indicating that injured athletes did not distinguish among task, barrier, and scheduling self-efficacy. Consequently, the present study sought to address the factorial validity of the AISEQ through confirmatory factor analysis. It was hypothesized that either a 3-factor solution with task, barrier, and coping self-efficacy would be noted or a 2-factor solution with task and coping self-efficacy would emerge.

Method

Participants. Participants were 237 athletes (115 men, 122 women) with various athletic injuries receiving physiotherapy at the Fowler Kennedy
Sports Medicine Clinic at the University of Western Ontario in London, Ontario. Participants ranged in age from 18 to 74 (mean age = 31.30, SD = 14.36). Athletes reported competing at various competitive levels, recreational (n = 134), national/provincial (n = 48), and varsity (n = 46), and participated in a variety of activities, with ice hockey (n = 34) and football (n = 17) cited most often.

**Measures.** Self-efficacy was evaluated using the AISEQ. The questionnaire comprised 10 items representing 3 types of self-efficacy: task (3 items), barrier (3 items), and scheduling (4 items). An example of a task item was “I am confident that I can perform all of the required rehabilitation exercises.” An example of a barrier item was “I am confident that I can do my rehabilitation exercises when I am tired.” An example of a scheduling item was “I am confident that I can follow the rehabilitation schedule outlined by my physiotherapist.” The first part of the questionnaire included demographic information such as age, gender, competition level, length of time in physiotherapy, and number of previous successfully rehabilitated injuries. The second part of the questionnaire consisted of the following 10 self-efficacy items:

- I am confident that I can perform all the required rehabilitation exercises.
- I am confident that I can follow directions from my physiotherapist.
- I am confident that I can remember all of my rehabilitation exercises.
- I am confident that I can do my rehabilitation exercises when I am tired.
- I am confident that I can do my rehabilitation exercises when I am in a bad mood.
- I am confident that I can do my rehabilitation exercises when I feel I do not have the time.
- I am confident that I can do my rehabilitation exercises even though I am feeling some discomfort.
- I am confident that I can do my rehabilitation exercises regularly no matter what.
- I am confident that I can follow the rehabilitation schedule outlined by my physiotherapist.
- I am confident that I can overcome any obstacles that may hinder me from regularly doing my rehabilitation exercises.

Participants rated their self-efficacy for each of the items on a confidence scale ranging from 0% (no confidence) to 100% (completely confident).

**Procedure.** Participants were contacted during their physiotherapy sessions at the Fowler Kennedy Sports Medicine Clinic and asked to complete the AISEQ. They were informed that the study was voluntary and that
their responses would be confidential. A letter of information outlining the purpose of the study accompanied each questionnaire. Once consent was obtained, the questionnaire was completed (in approximately 10 minutes) and returned directly to the attending researcher.

**Statistical Analysis.** A confirmatory factor analysis was performed using AMOS 4.0 with maximum-likelihood-estimation procedures to test the factorial validity of the AISEQ. Five fit indices were used to determine the adequacy of the model fit: chi-square index ($\chi^2$), chi-square likelihood-ratio statistic ($\chi^2/df$), root mean square error of approximation (RMSEA), adjusted goodness-of-fit index (AGFI), and the comparative-fit index (CFI). A nonsignificant $\chi^2$ indicates a good fit but is rarely achieved. The $\chi^2$:df ratio should be 2 or less, and an RMSEA of 0.06 is desirable. It is desirable to have an AGFI and CFI of 0.90. A repeated-measures ANOVA was performed to determine differences between task and coping self-efficacy.

**Results and Discussion**

**Factor Analysis.** The initial model indicated a 2-factor solution, task and coping self-efficacy, with the CFI indicating a good model fit but the AGFI and the RMSEA indicating an adequate to poor model fit. Elimination criteria and final model fit were based on modification indices, because the modification indices provide improvement about the model fit that would be obtained if the observed variables are allowed to cross-load on a non-intended factor. On the removal of questions 4, 8, and 10 from the coping self-efficacy subscale, the final model suggested an acceptable model fit (see Table 1). As hypothesized, the 1-factor solution for the AISEQ observed by Sordoni et al was not supported, indicating that athletes do distinguish between the 2 types of self-efficacy. The 2-factor (7-item) solution comprised task self-efficacy items and a mix of barrier and scheduling self-efficacy items (ie, coping self-efficacy).

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*AGFI indicates adjusted goodness-of-fit index; CFI, comparative-fit index; and RMSEA, root mean square error of approximation.
Self-Efficacy. Means and standard deviations for the items representing the 2 self-efficacy factors were determined: task mean = 88.57, SD = 11.54, and coping mean = 77.36, SD = 15.83. The overall self-efficacy mean was 80.72 (SD = 13.48). Cronbach alphas were .67 and .79 for the task and coping self-efficacy scales, respectively.

Overall, athletes were rather self-efficacious in regard to their rehabilitation regimes. A repeated-measures ANOVA revealed a significant difference between task and coping self-efficacy, $F_{1,236} = 184.69, P < .01$. Examination of the means indicated that the athletes were higher in task efficacy than coping efficacy. That is, athletes were more confident in their abilities to perform their exercises and follow instructions than in their ability to recover from their injuries in spite of any obstacles. This finding is consistent with the exercise-psychology research that makes a distinction between task and coping efficacy.\textsuperscript{24,25}

Study 2

In study 1, a confirmatory factor analysis supported a 2-factor solution for the AISEQ, indicating that athletes differentiate between 2 types of self-efficacy (task and coping) but do not differentiate between barrier and scheduling self-efficacy. Therefore, one purpose of study 2 was to replicate the results of study 1, thus verifying that the AISEQ measures both task and coping self-efficacy. A second purpose of study 2 was to examine the relationship between task and coping efficacy and the 3 functions of imagery assessed by the AIIQ-2 (ie, motivational, cognitive, and healing).

Imagery use has been associated with increases in self-efficacy during athletic injury rehabilitation.\textsuperscript{8} It has been suggested that imagery might be a source of efficacy information because “just mentally visualizing oneself successfully performing the desired task is enough to convince the athlete that he or she has the ability to successfully execute the task.”\textsuperscript{11(p193)} Imagery in rehabilitation might augment the self-efficacy of injured athletes by increasing their belief that the prescribed exercises can be successfully completed. Having people visualize themselves executing activities skillfully raises their perceived efficacy that they will be able to perform better.\textsuperscript{14} Sordoni et al\textsuperscript{13} found that only the use of healing imagery during rehabilitation was related to self-efficacy. They assessed task and coping efficacy as a single construct, however, rather than separately. Because cognitive imagery (as measured by the AIIQ-2) involves the rehearsal of rehabilitation exercises and task efficacy (as measured by the AISEQ) is the confidence to do rehabilitation exercises, it was hypothesized that the use of cognitive imagery would predict task efficacy. Using the same reasoning, it was expected that the use of motivational imagery would predict coping efficacy. As a result of healing imagery’s role in managing both pain and stress,\textsuperscript{32} it also was
hypothesized that the use of healing imagery would predict both task and coping efficacy.

A third purpose of the present study was to examine the relationships between task and coping efficacy and 3 measures of adherence: the frequency with which rehabilitation exercises were undertaken, the duration of these exercises, and the quality with which these exercises were completed. There is some evidence that indicates that injured athletes with higher self-efficacy adhere better to their rehabilitation programs. Furthermore, exercise-psychology research has demonstrated that task and coping efficacy differentially influence exercise behavior. Therefore, it was hypothesized that task efficacy would predict the quality with which exercises are done, and coping efficacy would predict the frequency and duration of exercise performance.

Several demographic variables (gender, competition level, previous successful athletic rehabilitation experiences, and length of time in rehabilitation) were examined as part of a set of secondary purposes. Sordoni et al found that women used more healing imagery than men did. Therefore, it was hypothesized that in the present study the same finding would emerge. Sport research has shown that athletes at higher competitive levels tend to use more imagery than do athletes at lower competitive levels. Furthermore, Sordoni et al found that during athletic injury rehabilitation, competitive athletes used more cognitive imagery than recreational athletes did. Therefore, it was hypothesized that athletes at higher competitive levels (provincial, national, and varsity) would use more cognitive imagery than would recreational athletes.

Rehabilitation studies have shown that injury history is related to rehabilitation efficacy, and individuals who have previously completed rehabilitation have higher self-efficacy for rehabilitation of their current injury. Therefore, it was hypothesized that previously injured athletes would display higher self-efficacy than first-time-injured athletes.

Sordoni et al found that women who competed at a recreational level had less self-efficacy than those participating at competitive levels. There were no differences between male recreational and competitive athletes. Therefore, it was hypothesized that injured female athletes would have lower self-efficacy scores than male athletes, and athletes at higher competitive levels would have greater self-efficacy than athletes at lower levels. In addition, as per Sordoni et al, it was hypothesized that length of time in rehabilitation would not be related to self-efficacy.

No specific hypotheses regarding adherence were made because there is no previous research regarding how gender, competition level, number of previous injuries, and length of time in rehabilitation influence adherence.
Method

Participants. Participants were 270 athletes (144 men, 126 women) with various athletic injuries receiving physiotherapy at the Fowler Kennedy Sports Medicine Clinic at the University of Western Ontario in London, Ontario, and Regal Physiotherapy in North York, Ontario. Athletes ranged in age from 18 to 75 years (mean = 36.81, SD = 15.30) and reported competing at various competitive levels—recreational (n = 190) and provincial, national, or varsity (n = 76)—in various sports, with golf (n = 32), running (n = 29), and soccer (n = 29) cited most often.

Measures. The survey required injured athletes to provide demographic information including age, gender, competition level, length of time in physiotherapy, and number of previous successful rehabilitation experiences. The athletes’ self-efficacy was then evaluated using the AISEQ composed of the 7 items confirmed in the first study.

Imagery use was evaluated using the AIIQ-2. The AIIQ-2 is composed of 12 items concerned with the injured athlete’s current use of imagery. Items are representative of the 3 functions of imagery: motivational imagery (4 items), cognitive imagery (4 items), and healing imagery (4 items). An example of a motivational imagery item is “I imagine myself achieving my treatment goals.” An example of a cognitive imagery item is “Before performing a rehabilitation exercise, I am able to imagine myself completing it perfectly.” An example of a healing imagery item is “I imagine my body repairing itself.” The participants rated their imagery use on a 9-point Likert scale from 1 (never) to 9 (always), indicating their use of that particular function of imagery. Sordoni et al reported that the psychometric characteristics of the AIIQ-2 are acceptable.

Rehabilitation adherence was evaluated in 3 ways: the frequency with which rehabilitation exercises were undertaken, the duration of these exercises, and the quality with which they were completed. Frequency of exercise was measured by a percentage score of 2 questions: “How often does your physiotherapist want you to do your rehabilitation exercises (eg, once per day)?” and “How often do you actually do your rehabilitation exercises?” Duration of exercise was measured by the percentage score of 2 questions: “How long (minutes) does your physiotherapist want you to spend on your exercises each time you do them?” and “How long (minutes) do you actually spend on your exercises each time you do them?” It should be noted that it was possible for athletes to obtain a score higher than 100% if they did more exercise than was recommended. Quality of exercise was measured with 1 question: “What percentage (%) of the time do you believe that you perform your rehabilitation exercises correctly?”

Procedure. Participants were contacted during their physiotherapy sessions at the Fowler Kennedy Sports Medicine Clinic and at the Regal
Rehabilitation Physiotherapy Clinic and asked to complete the survey. The recruitment and survey-administration procedures for the present study were identical to those followed in study 1. Completion of the questionnaire took approximately 15 minutes.

**Statistical Analysis.** A confirmatory factor analysis was performed using AMOS 4.0 to test the factor validity of the task and coping self-efficacy subscales of the AISEQ. The same 5 fit indices employed in study 1 were used to determine the adequacy of the model fit: $\chi^2$, $\chi^2/df$, RMSEA, AGFI, and CFI. Regression analyses were performed to examine the predictive relationships between imagery and self-efficacy and between self-efficacy and adherence. MANOVAs were conducted to examine the relationship among imagery, self-efficacy, adherence, and several demographic variables (gender, competition level, previous successful athletic rehabilitation experiences, and length of time in rehabilitation).

**Results and Discussion**

**Factor Analysis.** In the initial model the CFI, AGFI, and RMSEA indicated an adequate to poor model fit, so the modification indices were examined. Based on theoretical grounds, it was expected that task and coping efficacy would correlate with each other rather than function as orthogonal variables. Therefore, specific residuals among the task and coping variables were allowed to correlate. A reanalysis of the model was conducted, and the RMSEA, AGFI, CFI, and $\chi^2/df$ indices all suggested a good model fit (see Table 1). The $\chi^2$ value remained significant, but this was not surprising because a nonsignificant $\chi^2$ is rarely obtained in practice.

The confirmatory factor analysis yielded a 2-factor solution for the AISEQ, supporting the results found in the first study that injured athletes distinguish between task and coping self-efficacy in a rehabilitation setting. This solution is also consistent with exercise-psychology research that contends scheduling and barrier efficacy can be grouped together in 1 variable called “coping” efficacy. Therefore, in a rehabilitation setting, coping efficacy can be referred to as one’s confidence in one’s ability to perform one’s exercises in spite of environmental demands and challenges, including the scheduling of when to do these exercises.

**Self-Efficacy.** Given the results of the confirmatory factor analysis, descriptive statistics were calculated for the task (mean = 89.72, SD = 9.63) and coping (mean = 78.47, SD = 14.81) subscales of the AISEQ. Cronbach alphas were acceptable, being .81 and .80 for the task and coping self-efficacy subscales, respectively. To determine whether task self-efficacy was significantly higher than coping self-efficacy, a repeated-measures ANOVA was conducted. The difference between task and coping self-efficacy proved significant, $F_{1,269} = 250.76, P < .05$. 
As in study 1, injured athletes reported higher levels of task self-efficacy than coping self-efficacy. These findings parallel those reported by Rodgers et al\textsuperscript{22} for task and coping self-efficacy in exercise. It appears that when it comes to performing exercises, regardless of whether they are for fitness or injury rehabilitation, task self-efficacy is generally higher than coping self-efficacy.

**Imagery.** Descriptive statistics were also calculated for the motivational (mean = 5.72, SD = 2.23), cognitive (mean = 5.35, SD = 2.23), and healing (mean = 4.90, SD = 2.53) subscales of the AIIQ-2. Cronbach alphas were determined for the motivational, cognitive, and healing-imagery subscales, and these were acceptable, being .87, .88, and .92, respectively. A repeated-measures ANOVA was conducted to determine whether injured athletes differed in their use of the 3 functions of imagery, and a significant effect was found, \( F_{2,268} = 29.76, P < .05 \). Further analysis using a Tukey test \( (P < .05) \) indicated that injured athletes used more motivational and cognitive imagery than healing imagery.

This result is contrary to the finding of Sordoni et al\textsuperscript{13} that healing, motivational, and cognitive imagery are all used to about the same extent. The lower use of healing imagery in the present study might indicate that athletes are not as aware of the potential benefits of healing imagery as originally assumed by Sordoni et al. In a study by Scherzer et al,\textsuperscript{40} it was reported that athletes’ use of healing imagery during rehabilitation was quite minimal. Scherzer’s results taken together with the results of the present study suggest that injured athletes are potentially less likely to use imagery for healing purposes than for other functions.

**Adherence.** For adherence to the physiotherapy regimen, descriptive statistics were calculated for quality of exercise (mean = 80.30, SD = 13.46), frequency of exercise (mean = 89.27, SD = 27.32), and duration of exercise (mean = 91.18, SD = 25.05). To determine whether injured athletes differed in the 3 measures of adherence, a repeated-measures ANOVA was conducted. A significant effect was found, \( F_{2,264} = 25.37, P < .05 \), and further analysis using a Tukey test \( (P < .05) \) indicated that frequency and duration of exercise were rated higher than quality of exercise.

This finding indicates that although injured athletes perform their exercises with about the recommended frequency and for about the recommended duration, they might not be doing their exercises exactly the way their physiotherapists would like them to. Injured athletes will only obtain maximal benefits from performing their rehabilitation exercises and realize an optimal rate of recovery if they do their exercises correctly.\textsuperscript{45}

**Imagery and Self-Efficacy.** Hierarchical regression analyses were performed to determine whether imagery use predicted self-efficacy. It was assumed that cognitive imagery would be the primary contributor to the
task-self-efficacy equation and therefore was entered first, followed by healing and motivational imagery. Only cognitive imagery was a significant predictor of task self-efficacy, accounting for 1.8% of the variance in task self-efficacy, $F_{1,268} = 4.81, P < .05 (R = .133)$. In the second analysis, it was assumed that motivation imagery would be the primary contributor to the coping-self-efficacy equation and it was entered first, followed by healing and cognitive imagery. Imagery failed to be a significant predictor of coping self-efficacy.

Mills et al. observed that athletes who are higher in self-efficacy use more motivational imagery in competition than athletes with lower self-efficacy. Although a relationship was found between cognitive imagery and task self-efficacy in the present study, the amount of variance accounted for was very small. When judging capabilities, an individual will consider situational conditions, physical and emotional states, contextual influences, and temporal patterning of performance attainments. Although imagery can be a source of self-efficacy, the present findings indicate that for task and coping self-efficacy in athletic injury rehabilitation, other sources of self-efficacy appear to be more important than the use of imagery.

Self-Efficacy and Adherence. Hierarchical regression analyses were also conducted to determine whether task and coping self-efficacy were predictors of rehabilitation adherence (i.e., quality, frequency, and duration of exercise). To determine whether the quality with which rehabilitation exercises were completed was predicted by self-efficacy, task self-efficacy was entered first because it was expected to be a better predictor than coping self-efficacy; coping self-efficacy was entered second. Only task self-efficacy was a significant predictor, and it accounted for 11.5% of the variance, $F_{1,268} = 34.86, P < .05 (R = .339)$. This result supports the premise that a belief in one’s ability to perform one’s exercises will directly influence how effective one believes one is when actually performing the assigned exercises.

To determine whether the frequency and duration of doing rehabilitation exercises were predicted by self-efficacy, coping self-efficacy was entered first because it was expected to be a better predictor than task self-efficacy. Task self-efficacy was entered second. Only coping self-efficacy significantly predicted frequency of exercise, accounting for 8.1% of the variance, $F_{1,266} = 23.36, P < .05 (R = .284)$, indicating that a belief in one’s ability to perform one’s exercises despite obstacles affects how often one actually does perform the exercises.

Task and coping self-efficacy together proved to be significant predictors of exercise duration, accounting for 2.0% of the variance, $F_{1,265} = 4.85, P < .05 (R = .173)$. This suggests that belief in one’s ability to perform one’s exercises and perform them despite obstacles affects how long an individual will actually spend performing the exercises. Taken together, these results
indicate that task and coping self-efficacy differentially influence athletic injury-rehabilitation adherence and suggest that strong task and coping self-efficacy might help athletes adhere to their rehabilitation programs.

**Self-Efficacy and Demographic Variables.** To determine whether gender, competition level (recreational, competitive), length of time in rehabilitation (<4 weeks, 5–10 weeks, >10 weeks), and number of previous injuries (0, 1–2, >3) influenced task and coping self-efficacy, separate MANOVAs were conducted for each of these independent variables. Competition level was reduced to 2 categories because the number of athletes in each of the original competitive categories (ie, provincial, national, and varsity) was quite small.

The only significant multivariate effect was for number of previous injuries, Pillai trace = .05, $F_{4,534} = 3.73$, $P < .05$. Further analysis of this result indicated that those who had 3 or more injuries were significantly more confident in their abilities to perform their exercises (task self-efficacy) than were those who were injured for the first time.

Johnson argued that a lack of knowledge about the rehabilitation process can diminish a first-time-injured athlete’s belief in his or her own inherent abilities to recover. In contrast, because of previous experience previously injured athletes are better able to master the initial feelings of fear and anxiety and focus on their rehabilitation programs. In addition, past experience is one of the key sources of self-efficacy. Therefore, it would be expected that previously injured athletes would demonstrate higher efficacy scores because they have a better understanding of the rehabilitation process and might be already familiar with the required rehabilitation exercises.

Gender was not a significant factor in any of the self-efficacy analyses performed in the present study. Lirgg et al suggested that there could be differences in men’s and women’s self-efficacy levels depending on the requirements of the task. The more masculine a task is perceived to be, the less self-efficacy a woman would have in relation to a man, and vice versa. It is probable that this premise can be translated into the rehabilitation setting. There are certain parts of rehabilitation exercise that might be perceived as either masculine or feminine (weight lifting vs balancing exercises), but in general, a rehabilitation program involves a combination of various skills. Therefore, overall, rehabilitation exercise can be viewed as a gender-neutral activity. Consequently, in regard to performing rehabilitation exercises, it would be expected that there would be no differences in reported self-efficacy scores between men and women, as was found in the present study.

Sordoni et al found that female recreational athletes had significantly less self-efficacy with respect to injury rehabilitation than women and men who participated at higher competitive levels. Therefore, it might be expected that athletes at higher competitive levels in the present study
would report higher levels of task and coping self-efficacy. Nonetheless, competitive and recreational athletes did not differ in task and coping self-efficacy, even when gender was taken into consideration. It is possible that although recreational and competitive athletes might differ in their sport abilities, they probably do not differ in their ability to undertake an injury rehabilitation program. That is, they can perform the rehabilitation exercises equally well and overcome any challenges to following their rehabilitation regimen to about the same extent.

In the present study, task and coping self-efficacy did not vary with the length of time an injured athlete had been in rehabilitation. One possible explanation for this finding is that length of time in rehabilitation might not influence self-efficacy unless an athlete remains in rehabilitation beyond his or her estimated time of recovery.

**Imagery and Demographic Variables.** A similar set of MANOVAs was undertaken for imagery use. Gender, competition level, length of time in rehabilitation, and number of previous injuries served as the independent variables, and motivational, cognitive, and healing imagery were the dependent variables. No significant multivariate effects were found.

Gender is a variable that has a minimal influence on cognitive and motivational imagery use. Although the healing-imagery mean for the men was slightly lower than that of the women, the difference failed to be significant. Taking the present results and those of Sordoni et al. together, it can be concluded that men and women typically use the 3 functions of imagery in athletic injury rehabilitation to about the same extent, with perhaps the exception that women tend to use healing imagery somewhat more than men do.

Competitive and recreational athletes reported using cognitive imagery about equally often. In addition, both groups of injured athletes employed motivational and healing imagery to the same extent. Researchers have stated that the increased use of imagery by competitive athletes could be a result of their greater commitment to their sport. It is probable that in terms of injury rehabilitation, recreational and competitive athletes are equally committed to achieving a full recovery and therefore use imagery to the same extent.

Neither number of previous injuries nor length of time in rehabilitation influenced the use of imagery by injured athletes. The absence of a relationship between imagery and time in rehabilitation is somewhat surprising considering the fact that imagery is considered dynamic in nature and has been shown in sport research to vary over a competitive season. This trend is obviously not evident in injury rehabilitation. Imagery use during a competitive season probably changes in relation to situational demands and pressures (eg, regular season vs playoffs). In a rehabilitation setting, the demands might be more stable, resulting in consistent imagery use over time.
**Adherence and Demographic Variables.** To determine whether gender, competition level, length of time in rehabilitation, and number of previous injuries influenced adherence (ie, quality, frequency, and duration of exercises), separate MANOVAs were conducted for each of these independent variables. Significant multivariate effects were found for competition level, Pillai trace = .03, $F_{3,258} = 2.75$, $P < .05$, and number of previous injuries, Pillai trace = .09, $F_{6,524} = 3.97$, $P < .05$.

In the univariate analysis of competition level, there was a significant effect for quality of exercise, $F_{1,264} = 7.45$, $P < .05$. Competitive athletes reported performing their exercises at a higher quality than recreational athletes. This could be because of exercise experience level. Competitive athletes commonly include weight- and strength-training exercises in their overall training programs. Recreational athletes are much less likely to do these types of exercises. It is plausible that from their sport experience, competitive athletes might already be familiar with the types of exercise required for rehabilitation and therefore believe that they are able to perform them more correctly than the recreational athletes.

For number of previous injuries, the univariate analysis produced a significant effect for quality of exercise, $F_{2, 67} = 4.33$, $P < .05$, and frequency of exercise, $F_{2,265} = 7.99$, $P < .05$. Further analysis using a Tukey test ($P < .05$) indicated that those who had had 3 or more injuries reported performing their exercises with a higher quality and more frequently than those who were first-time injury sufferers.

Task self-efficacy was shown to be a significant predictor of quality of exercise, and athletes with >1 prior injury were significantly higher in task self-efficacy than first-time-injured athletes. Therefore, it follows that previously injured athletes would have a higher belief in the quality of their exercise performance than first-time-injured athletes. In addition, in a rehabilitation setting previously injured athletes have certain advantages over first-time-injured athletes. Having already gone through the process of rehabilitating an injury, previously injured athletes are already familiar with the rehabilitation routine and might not need as much supervision and reinforcement as the first-time-injured athletes. Previously injured athletes might also be more diligent in performing their exercises. First-time-injured athletes might feel unsure of their rehabilitative abilities because of the novelty of the situation and might be less sure about how well they are performing their exercises and the amount of effort needed to rehabilitate an injury.

**General Comments**

The purpose of this research was to statistically support the factor structure of the AISEQ and then to investigate the relationships among self-efficacy, imagery use, and rehabilitation adherence. In study 1 a confirmatory factor
analysis of the AISEQ yielded 2 types of self-efficacy: task and coping. In
study 2, the 2-factor solution was upheld, indicating that athletes differenti-
ate between task and coping self-efficacy during rehabilitation. In addition,
the AISEQ was shown to be a valid, reliable measure of task and coping
self-efficacy. Injured athletes were higher in task than in coping efficacy and
more likely to imagine completing their exercises and achieving treatment
goals than imagining their injuries healing. In injury rehabilitation, imagery
was not a strong predictor of task and coping self-efficacy, but with respect
to adherence, task and coping self-efficacy did exert a significant influence
on frequency, duration, and quality of exercise.

The present study offers interesting insights into self-efficacy, imagery
use, and adherence in injury rehabilitation but does have a few limitations.
The study did not evaluate perceived severity of injury, which can be an
important moderator in the postinjury psychological response.3 If an injury
is perceived to be extremely serious, feelings of doubt about a full recovery
can arise, thus affecting confidence levels and the time and effort required
to rehabilitate the injury itself. In addition, various types of athletic injuries
were not differentiated. It is unknown whether different types of injuries
(eg, broken bone vs ligament strain) are related to type and amount of self-
efficacy or imagery used in the rehabilitation of those injuries. In addition,
stage of healing might be an important factor in self-efficacy and imagery
use. Athletes were evaluated in varying stages of rehabilitation but were not
distinguished or compared according to stage of healing. A cross-sectional
or longitudinal study in which athletes are grouped based on stage of heal-
ing or injury type and measured over the duration of rehabilitation might
provide valuable information regarding fluctuations in self-efficacy and
imagery use during rehabilitation. Problem intervals in rehabilitation could
be identified, and interventions could then be designed to target stages of
low self-efficacy and imagery use.

There are a number of practical implications arising from the results
of the present study. Research has shown that self-efficacy is important in
injury rehabilitation.3,4,8 In the present study, although athletes were fairly
efficacious in their injury rehabilitation, they lacked some confidence in their
ability to perform their exercises when faced with challenges. Therefore,
therapists need to employ techniques geared toward augmenting coping
self-efficacy. Introducing treatment goal setting, creating a rehabilitation
buddy system, and allowing more flexible scheduling are potential options
that might supplement athletes’ confidence to overcome challenges in follow-
ing their rehabilitation program.

Athletes frequently use motivational and cognitive imagery during
training and competition. The present study showed that athletes are start-
ing to acknowledge the benefits of imagery use in rehabilitation. Healing
imagery was used less than cognitive and motivational imagery, however. It
is possible that athletes are unsure of exactly what they should be imaging.
Therapists should attempt to explain to athletes the nature of their injuries and how the body heals itself. Equipped with a proper understanding of the healing process, athletes might be encouraged to use more healing imagery during their rehabilitation.

Rehabilitation can be a very daunting experience, especially for first-time-injured athletes who are naïve to the rehabilitation process. In the present study it was found that previously injured athletes were more diligent than the first-time-injured athletes in performing their exercises. Therapists should ensure that first-time-injured athletes are clear about what is required in order to achieve a full recovery.

In summary, task and coping self-efficacy appear to be distinguishable constructs in exercise rehabilitation. In terms of the relationship between self-efficacy and imagery, although imagery can be an important source of self-efficacy, in rehabilitation this does not appear to be the case, and other variables that might influence self-efficacy should be considered. In addition, in devising strategies to increase rehabilitation adherence, task and coping self-efficacy should be an integral part of the process. Finally, a number of the results found for self-efficacy and imagery use in sport (eg, motivational imagery use influencing self-efficacy, competitive level influencing imagery use) were not evident in the present study. This suggests that self-efficacy and imagery operate differently in athletic injury rehabilitation than in sport.

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References