Psychological Skills and Adherence to Rehabilitation After Reconstruction of the Anterior Cruciate Ligament

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Objective: To examine the relationship between self-reported use of psychological skills and rehabilitation adherence.

Design: Prospective correlational design.

Setting: Outpatient physical-therapy clinic specializing in sports medicine.

Patients: Fifty-four patients (17 women and 37 men) undergoing rehabilitation after anterior-cruciate-ligament reconstruction.

Main Outcome Measures: An abbreviated version of the Sports Injury Survey (Ievleva & Orlick, 1991) was administered approximately 5 weeks after surgery to assess use of goal setting, imagery, and positive self-talk. Four adherence measures were obtained during the remainder of rehabilitation: attendance at rehabilitation sessions, practitioner ratings of patient adherence at rehabilitation sessions, patient self-reports of home exercise completion, and patient self-reports of home cryotherapy completion.

Results: Goal setting was positively associated with home exercise completion and practitioner adherence ratings. Positive self-talk was positively correlated with home exercise completion.

Conclusions: Use of certain psychological skills might contribute to better adherence to sport-injury rehabilitation protocols.

Key Words: compliance, knee surgery, psychology


The sport-performance benefits of training in psychological skills such as goal setting, imagery, and positive self-talk are well documented.\(^1,2\) There is also evidence that psychological-skills training might have a beneficial effect on the rehabilitation of sport injuries. For example, Ievleva and Orlick\(^3\) found in a retrospective correlational study that self-reported use of goal
setting, positive self-talk, and healing imagery was associated with rapid recovery of functioning in athletes with knee or ankle injuries. Subsequent experimental research has shown that psychological interventions featuring training in goal setting,\textsuperscript{4,5} imagery/relaxation,\textsuperscript{6-7} and positive self-talk\textsuperscript{8} can positively affect sport-injury-rehabilitation outcomes.

Another aspect of sport-injury rehabilitation that might be enhanced by using psychological skills is adherence to prescribed rehabilitation protocols. Using psychological techniques in an attempt to recover more rapidly and completely from injury is presumably reflective of an athlete’s belief that he or she can influence the outcome of rehabilitation. Beliefs regarding control over rehabilitation outcomes have been positively correlated with both adherence to sport-injury rehabilitation regimens\textsuperscript{9-11} and perceived rate of recovery after knee surgery.\textsuperscript{9,11} Thus, when athletes believe that they have some control over the rehabilitation process, they are more likely to take action to exert such control (eg, by implementing psychological skills) and follow their injury-rehabilitation programs more completely.

The purpose of this study was to examine the relationship between self-reported use of psychological skills and adherence to a sport-injury-rehabilitation regimen. Based on recent research indicating that goal setting can enhance adherence to sport-injury rehabilitation\textsuperscript{12} and that control beliefs are associated with sport-injury-rehabilitation adherence,\textsuperscript{9-11} it was hypothesized that positive associations would exist between athletes’ self-reported use of psychological skills and their adherence to rehabilitation.

**Methods**

**Participants**

Participants in this study were 54 patients (17 women and 37 men) at an orthopedic physical-therapy clinic specializing in sports medicine. All participants were undergoing rehabilitation after anterior-cruciate-ligament (ACL) reconstruction performed by 1 of 3 orthopedic surgeons. The mean age of participants was 28.00 (SD = 8.33) years. The racial/ethnic breakdown of the sample was as follows: 46 (85%) White, not of Hispanic origin; 5 (9%) Hispanic; and 3 (6%) Black, not of Hispanic origin. In terms of sport involvement, 28 (52%) participants indicated that they were competitive athletes, 25 (46%) indicated that they were recreational athletes, and 1 (2%) reported being a nonathlete.

**Measures**

The goal-setting, healing-imagery, and positive-self-talk subscales of the Sports Injury Survey\textsuperscript{3} were used to assess the extent of participants’ use of psychological skills during rehabilitation. The goal-setting subscale has 3 items: “Do you set any daily goals for recovery?” “Have you set any
long-term goals for recovery?” and “Have you set goals about your return to sports?” Responses to the goal-setting items are rated on an 11-point Likert-type scale, with 0 corresponding to never and 10 corresponding to very much so. The imagery subscale consists of a single item, scored on an 11-point scale ranging from 0 (never) to 10 (all the time): “Do you ever do any healing imagery, where you try to see (visualize) or feel your knee healing?” Positive self-talk was assessed by 1 item directed to participants who responded affirmatively to the question “Do you find yourself ‘talking’ to yourself about your injury?”: “To what extent is this self-talk positive in comparison to negative?” Blanks were provided for respondents to indicate the respective percentages of positive and negative self-talk. Although data regarding the reliability and validity of the Sports Injury Survey were not provided by the developers of the instrument, internal consistency was adequate for the goal-setting scale (alpha = .70) in the current study.

Adherence to rehabilitation was assessed 4 ways. The first was to record attendance at rehabilitation sessions. A ratio of sessions attended to sessions scheduled was calculated, consistent with procedures used in previous research. Second, adherence was assessed using the Sport Injury Rehabilitation Adherence Scale, which is a measure on which participants are rated by their rehabilitation practitioners with respect to the following 3 items: “Circle the number that best indicates the intensity with which this patient completed rehabilitation exercises during today’s appointment,” “During today’s appointment, how frequently did this patient follow your instructions and advice?” and “How receptive was this patient to changes in the rehabilitation program during today’s appointment?” All 3 items are scored on 5-point Likert-type scales. For the first item of the scale, the endpoints are minimum effort and maximum effort. The latter 2 items are anchored with never/always and very unresponsive/very receptive, respectively. In support of the construct validity of the Sport Injury Rehabilitation Adherence Scale, scores on the scale have been significantly correlated (r = .21, P < .05) with attendance at rehabilitation sessions. A Cronbach alpha coefficient of .82 has been obtained for the scale. Finally, adherence was assessed by having participants rate how much of their prescribed home rehabilitation exercises and home cryotherapy they had completed during the previous week on separate scales from 1 (none) to 10 (all).

Procedure

The procedure of this study was approved by the Institutional Review Board. Patients were recruited as participants by their orthopedic surgeon prior to ACL reconstructive surgery. A research assistant described the purpose and procedures of the study to the patients who expressed interest in participating in the study. Patients who agreed to participate in the study (and their parents or guardians when appropriate) read and completed an informed consent form at their preoperative physical therapy appointment,
held approximately 10 days before surgery.

Following surgery, measures of adherence to rehabilitation were taken at each scheduled physical therapy appointment. Attendance/nonattendance was documented, the Sport Injury Rehabilitation Adherence Scale was administered to the patients’ physical therapist or athletic trainer, and patients rated their completion of prescribed home exercises and cryotherapy since their last physical therapy appointment. The abbreviated Sports Injury Survey was administered to all participants approximately 5 weeks postsurgery.

The accelerated rehabilitation protocol after ACL reconstruction developed by Shelbourne and colleagues was prescribed by the orthopedic surgeons and was adhered to by the physical therapists affiliated with the study. This physical-therapy protocol emphasizes early attainment of range of motion (extension and flexion of the knee), quadriceps strength, and normal gait.

Statistical Analysis

Means were computed for scores on the Sport Injury Rehabilitation Adherence Scale and the items assessing adherence to home rehabilitation exercises and home cryotherapy across rehabilitation appointments. Descriptive statistics and intercorrelations were calculated for the psychological-skills and adherence variables. Scores on the goal-setting and imagery subscales of the abbreviated Sports Injury Survey were used in regression analyses to predict the 4 adherence indices (using scores obtained subsequent to administration of the abbreviated Sports Injury Survey). We had intended to use positive self-talk scores as an additional predictor variable, but only 20 participants indicated that they used self-talk in association with their rehabilitation. Consequently, Pearson correlations were calculated between positive self-talk and scores on each of their 4 adherence measures. All statistical analyses were computed using the Statistical Package for the Social Sciences (SPSS for Windows).

Results

Means and SDs of the psychological-skills and adherence measures are presented in Table 1. The regression equation predicting home exercise completion was statistically significant, $F_{2,42} = 6.00, P < .01, R^2 = .22$. Goal setting was a significant predictor of home exercise completion (beta = .51, $P < .005$). The regression equation predicting Sport Injury Rehabilitation Adherence Scale ratings was also statistically significant, $F_{2,42} = 3.49, P < .05, R^2 = .14$. Goal setting was a significant predictor of Sport Injury Rehabilitation Adherence Scale ratings (beta = .35, $P < .05$). Neither home cryotherapy completion nor attendance was predicted by use of goal setting and imagery. In the correlational analysis, a significant positive correlation
was found between positive self-talk and completion of prescribed home exercises ($r = .52, P < .05$). There were no significant correlations between positive self-talk and home cryotherapy completion ($r = .28, P > .05$), Sport Injury Rehabilitation Adherence Scale ratings ($r = .32, P > .05$), and attendance ($r = –.21, P > .05$).

### Discussion

In this study, self-reported use of goal setting was associated with home- and clinic-based measures of adherence to a postsurgical sport-injury-rehabilitation program. These results augment experimental evidence for the beneficial effect of goal setting on sport-injury-rehabilitation adherence\textsuperscript{12} and provide indirect support for research documenting enhancement of sport-injury-rehabilitation outcomes as a function of goal setting.\textsuperscript{4,5} A potential explanation for the significant relations obtained between goal setting and adherence in the current investigation is that by setting rehabilitation goals, athletes become more focused on completing their rehabilitation tasks as a means of achieving their goals and, therefore, are more likely to adhere to the prescribed rehabilitation protocol.

Self-reported use of healing imagery was associated with none of the 4 indices of sport-injury-rehabilitation adherence (i.e., attendance, home exercise completion, home cryotherapy completion, and Sport Injury Rehabilitation Adherence Scale). These findings suggest that the favorable impact of imagery on sport-injury-rehabilitation outcomes\textsuperscript{6} occurs independent of adherence to the particular rehabilitation program. Thus, imagery use might contribute to better recovery from sport injuries without affecting rehabilitation adherence.

Although most participants denied using self-talk with regard to their rehabilitation, positive self-talk was positively correlated with adherence
(to home rehabilitation exercises) among participants who reported using self-talk. This finding is based on a relatively small number of participants, so caution is advised in interpreting the results. Nevertheless, in light of research showing that a positive outlook on one’s rehabilitation was associated with faster recovery, it seems plausible that positive self-talk could help athletes stay motivated to adhere to their rehabilitation regimen.

Several limitations of the current study warrant mention. First, the correlational research design precludes drawing inferences of causality regarding the relation between use of psychological skills and sport-injury-rehabilitation adherence. Although the prospective findings in the current study provided evidence of a time–order relationship between use of psychological skills and rehabilitation adherence (a prerequisite for causality), the possibility that a third variable (eg, a personality characteristic such as self-motivation or internal locus of control) caused the occurrence of both psychological-skills use and rehabilitation adherence cannot be ruled out. Consequently, we recommend that future research incorporate experimental designs in which use of one or more psychological skills is manipulated. Such an approach would also obviate the problem of relying on self-report to assess use of psychological skills.

Second, although we employed a standardized instrument that had been used in a previous published study, the use of single-item scales for imagery and positive self-talk is less than optimal from a psychometric standpoint. We recommend that multiple-item scales be used in future research to facilitate an assessment of the scales’ internal consistency and to increase their reliability. The Athletic Injury Imagery Questionnaire developed recently by Sordoni et al would be a good tool for assessing imagery use in subsequent investigations.

Third, the findings of the current study are limited to athletes undergoing rehabilitation after ACL reconstruction. Although it is likely that the results would generalize to athletes with other types of injuries and rehabilitation protocols, this possibility should be demonstrated empirically.

Fourth, although only 11 patients indicated that they did not want to participate in the study during the 30 months in which the research was carried out, it should be noted that the findings are representative only of patients who consented to participate in a research investigation.

In conclusion, it appears that taking rehabilitation into one’s own hands by setting rehabilitation goals and maintaining a positive internal dialogue might have a favorable impact on adherence, a rehabilitation process that can be problematic for athletes with injury and have important implications for rehabilitation outcomes. Receiving guidance in acquiring and implementing psychological skills from a sport-injury-rehabilitation professional might help facilitate adherence to the rehabilitation regimen and, ultimately, further enhance the rehabilitation experience of athletes with injuries. Further inquiry in this area is needed to develop an even
clearer picture of the potential utility of psychological skills during recovery from sport injury.

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References


