

Injury Rehabilitation Overadherence: Preliminary Scale Validation and Relationships With Athletic Identity and Self-Presentation Concerns

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Context: Evidence suggests that nonadherence to rehabilitation protocols may be associated with worse clinical and functional rehabilitation outcomes. Recently, it has been recognized that nonadherence may not only reflect a lack of rehabilitation engagement but that some athletes may “over-adhere” to their injury-rehabilitation regimen or risk a premature return to sport. Presently, no measure of overadherence exists, and correlates of overadherence and risking a premature return to sport remain uncertain.

Objective: To provide initial validation of a novel injury-rehabilitation overadherence measure (study 1) and to examine correlates of overadherence and risking a premature return to sport (study 2).

Design: Cross-sectional study.

Setting: High school athletes (study 1) and collegiate athletes (study 2).

Patients or Other Participants: In study 1, 118 currently injured US adolescent athletes competing in a range of high school sports participated. In study 2, 105 currently injured collegiate athletes (National Collegiate Athletic Association Divisions I–III) volunteered.

Main Outcome Measure(s): The Rehabilitation Overadherence Questionnaire was a novel instrument developed to assess injured athletes' tendency toward overadherence behaviors and beliefs. We used an adapted version of the Injury Psychological Readiness to Return to Sport Scale to assess the tendency to risk a premature return to sport.

Results: In study 1, the construct validity of the overadherence measure was supported using principal axis factoring. Moreover, bivariate correlation and regression analyses indicated that self-presentation concerns and athletic identity were positive predictors of adolescent rehabilitation overadherence and a premature return to sport. Study 2 provided support for the 2-factor structure of the overadherence measure found in study 1 via confirmatory factor analysis. Further support for the relationship among self-presentation concerns, athletic identity, and rehabilitation overadherence was also noted.

Conclusions: The Rehabilitation Overadherence Questionnaire is a valid and reliable measure of overadherence.

Key Words: athletic identity, premature return to sport, sport psychology

Key Points

- Concerns about self-presentation and athletic identity predicted risky rehabilitation behaviors in injured adolescent and collegiate athletes.
- A number of tools are available to assist health care professionals in determining which athletes are likely to behave in potentially dangerous ways during injury rehabilitation. The Rehabilitation Overadherence Questionnaire is a valid and reliable instrument, but it requires further study.
- Identifying at-risk athletes allows athletic trainers to intervene through cognitive reframing, motivational interviewing, goal setting, and other psychological techniques.

Adherence to injury rehabilitation has been examined extensively in the sports medicine literature and has been defined as “behaviors an athlete demonstrates by pursuing a course of action that coincides with the recommendations of the athletic trainer.”^{1(p252)} Although adherence is associated with enhanced clinical and functional rehabilitation outcomes,^{2,3} many athletes fail to comply with practitioner-recommended guidelines.¹ Recent evidence^{4–7} suggests that athletes' failure to comply with treatment protocols may not only reflect underadherence (ie, doing too little rehabilitation) but can also

reflect overadherence, whereby athletes attempt to do too much too quickly, fail to comply with activity restrictions, or demonstrate excessive efforts to push through harmful pain symptoms. *Overadherence* may be defined as the behaviors and underlying beliefs of athletes who engage in rehabilitation efforts that exceed practitioner-recommended guidelines. In addition, the quest for athletic excellence and the “win-at-all costs” environment of elite sports may encourage athletes to risk a premature return to sport.⁶ Specifically, athletes who are overzealous to achieve athletic goals may be willing to risk a premature return to

sport despite clinical and functional indicators that suggest the return should be delayed.⁷ Thus, efforts to document rehabilitation adherence rates must take into account athlete behaviors that relate to doing too much too soon and beliefs about the wisdom of pushing past recommended limits. Having a valid and reliable assessment tool with which to measure overadherence is therefore clearly important from both practical and research standpoints. From the practical perspective, such a questionnaire will assist athletic trainers in identifying overadhering athletes who are potentially at risk for rehabilitation setbacks or compromised clinical or functional outcomes.^{4,7} Additionally, identifying patients engaging in rehabilitation overadherence may alert athletic trainers to those requiring psychosocial intervention (eg, reframing, social support) or referral, key educational competencies currently required of all Board-certified athletic trainers.⁸ Last, examining the factors associated with injury rehabilitation overadherence and a willingness to risk a premature return to sport will enable practitioners and researchers to target key factors in developing appropriate interventions. Presently, however, a valid and reliable overadherence scale does not exist, and correlates of rehabilitation overadherence and willingness to risk premature return have yet to be empirically examined.

In an effort to identify correlates of rehabilitation overadherence and willingness to risk premature return, the Integrated Model of Psychological Response to Sport Injury and Rehabilitation of Wiese-Bjornstal et al⁹ may be of theoretic and practical value. The key premise of this model is that each individual responds differently to an injury depending upon his or her assessment of the meaning of the injury, its perceived consequences, and one's ability to cope with the consequences. Cognitive appraisals are proposed to influence athletes' emotional and subsequent behavioral responses to injury; one important behavioral response is adherence. Wiese-Bjornstal et al⁹ also suggested that a host of personal (eg, personality traits, history of stressors, demographic variables) and situational (eg, timing of injury in the season, social support, rehabilitation environment) factors operate in isolation or in conjunction to influence an athlete's cognitive, emotional, and behavioral responses to sport injury.

Two personal factors from the Wiese-Bjornstal et al⁹ model that may be associated with rehabilitation overadherence and a premature return are self-presentational concerns and athletic identity. *Self-presentation* refers to an individual's interest in controlling how he or she is perceived or evaluated by others and in creating desired impressions.¹⁰ Individuals high in self-presentational concerns have been shown to engage in risky behaviors (eg, substance abuse, exercise avoidance) if they assume that doing so will result in favorable impressions.¹¹ Similarly, injured athletes who experience high self-presentation concerns may compensate with efforts to overdo their rehabilitation or subscribe to maladaptive beliefs (eg, the need to expedite the rehabilitation process) if they perceive that such actions will result in approval from coaches, teammates, and fans. A second factor, athletic identity, also likely influences the extent to which athletes engage in injury rehabilitation overadherence or risking a premature return. *Athletic identity* has been defined as the degree to which an individual identifies with the athlete role.¹² Although a certain level of identification with the athlete

role may be beneficial, injured athletes with a high athletic identity may be inclined to overadhere to their rehabilitation or to risk a premature return to sport given the imperative to reinstate the sporting activity that defines them. Athletes with a high athletic identity may also be susceptible to engaging in rehabilitation overadherence and risking premature return because they perceive the need to perform (or demonstrate) behaviors and actions that are consistent with the athlete role (eg, pushing through pain, avoiding reports of pain).¹³

Personal factors other than self-presentation concerns and athletic identity may be associated with injury rehabilitation overadherence. For example, personality traits such as trait anxiety, conscientiousness, or neuroticism may give rise to injury rehabilitation overadherence and premature return to sport. Given previous research highlighting the role of self-presentation concerns and athletic identity in predicting health-risk behaviors, it seemed a reasonable starting point to examine these factors as potential correlates of overadherence and willingness to return prematurely. Considering the dearth of empirical evidence examining overadherence and risking a premature return in a sport-injury context, we conducted 2 studies to examine the proposed relationships. Because no measure of overadherence exists, the aim of study 1 was to develop the overadherence measure and provide initial validation using principal axis factoring (PAF) in a sample of injured adolescent athletes. Our second aim was to examine associations between self-presentation concerns, athletic identity, and 2 outcome measures: overadherence and willingness to risk a premature return to sport. Given our interest in examining the cognitive and behavioral aspects of rehabilitation overadherence, we first hypothesized a 2-factor structure reflecting these dimensions. Consistent with previous theorizing, we also hypothesized that self-presentational concerns and athletic identity would be positively associated with overadherence and willingness to risk a premature return. In study 2, we sought to provide further validation of the overadherence measure using confirmatory factor analysis (CFA) with a sample of collegiate athletes and to examine the replicability of findings from study 1.

STUDY 1 METHODS

Participants

A total of 118 currently injured adolescent athletes (male = 61 [52%], female = 57 [48%]) from the United States, competing in a range of high school sports, participated in the study. The sports consisted of football (n = 43, 36%), basketball (n = 28, 24%), soccer (n = 13, 11%), volleyball (n = 10, 8%), track and field (n = 6, 5%), baseball (n = 5, 4%), softball (n = 5, 4%), cheerleading (n = 4, 3%), tennis (n = 2, 1.7%), dance (n = 1, 0.8%), and swimming (n = 1, 0.8%). Adolescents were recruited if they were (a) 13–18 years of age (mean = 15.97 ± 1.41 years); (b) actively involved in an individual or team school sport, local club, or community league; (c) currently experiencing an injury requiring a minimum 2-week absence from sport training and competition; and (d) currently receiving physiotherapy treatment for their injury. We selected participants aged 13–18 years who were actively involved in a school team,

local club, or community league because of our interest in examining adolescents who were consistently involved in athletic participation (ie, could be considered athletes). Moreover, we surveyed athletes who were out of training and competition for a minimum of 2 weeks at the time of questionnaire administration in order to ensure a minimum injury severity, minimize recall biases, and maximize the accuracy of self-reported overadherence or willingness to prematurely return to sport. Last, participants were required to be currently receiving physiotherapy treatment because of our interest in examining rehabilitation overadherence. Participants self-reported an average of 14.18 ± 8.93 hours per week in sport training before the injury (range = 2–40 hours) and had competed in their current sport for an average of 6.69 ± 2.80 years (range = 1–14 years). Participants had experienced a wide variety of injuries (torn anterior cruciate ligament: $n = 41$, with 37 requiring surgery; medial malleolus, fibula, or distal tibia fractures: $n = 27$, with 12 requiring surgery; shoulder dislocation: $n = 9$, with 4 requiring surgery; carpal tunnel syndrome: $n = 1$, which required surgery). In total, 68 athletes (57.6%) required surgery for their injuries. The average length of time participants were unable to participate as a consequence of injury was 2.7 ± 2.01 months (range = 0.5–7 months). All participants received treatment from Board of Certification-certified athletic trainers.

Instruments

Self-Presentation in Sport Questionnaire (SPSQ). The McGowan et al¹⁴ 21-item scale was used to assess the extent to which the injured athletes experienced self-presentational concerns regarding their return to sport after injury. The scale consists of 4 subscales: Concerns about appearing athletically untalented ([AAU], 6 items: eg, *untalented, underskilled*; $\alpha = .90$), physical appearance ([PA], 5 items: eg, *flabby, ugly or unpleasant in my uniform*; $\alpha = .82$), appearing fatigued/lacking energy ([FLE], 4 items: eg, *exhausted, tired*; $\alpha = .90$), and mental composure inadequacies ([MCI], 6 items: eg, *unfocused, nervous under pressure*; $\alpha = .84$). All items were measured on a 5-point Likert scale with anchor statements ranging from 1 (*Never*) to 5 (*Always*). A statement stem (eg, “In thinking about my return to competition I am concerned that other people will see me as appearing . . .”) prefaced items in each subscale.

To ensure suitability for an adolescent population, we amended a number of items. *Athletically incompetent* (AAU subscale) was changed to *athletically incapable*. *Physically untuned* was changed to *lack in strength* (PA subscale). *Fatigued* (FLE subscale) was changed to *worn out*. *Distressed* (MCI subscale) was changed to *worried*. The amended items were pilot tested with 10 adolescents, aged 12–17 years, all of whom indicated clarity of comprehension. Strong subscale internal consistency was observed in this investigation, with AAU $\alpha = .93$, PA $\alpha = .82$, FLE $\alpha = .94$, and MCI $\alpha = .84$. The adapted scale has shown good psychometric properties in previous research with adolescents.¹⁵

Athletic Identity Measurement Scale (AIMS). The 7-item AIMS¹⁶ was used to assess the extent to which participants identified with the athlete role. All items were measured on a 7-point Likert scale with anchor statements

ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Sample items are, “I consider myself an athlete,” “I have many goals related to sport,” and, “Most of my friends are athletes.” A statement stem (ie, “Indicate your agreement with each statement as it relates to you . . .”) prefaced items from each subscale. The scale has demonstrated reliability and validity in adolescent athlete samples.^{17,18} Test-retest reliability (0.89), internal consistency (0.80–0.93), concurrent validity, and construct validity via factor analysis have been demonstrated previously.¹² Internal consistency in the present investigation was 0.76.

Rehabilitation Overadherence Questionnaire (ROAQ).

The ROAQ was a novel instrument developed to assess injured athletes’ tendency toward overadherence behaviors and beliefs. The initial 19 items (10 behavioral, 9 cognitive) were derived from examining the psychosocial sport-injury and sports medicine literature and indicators of overadherence identified by 3 of the authors (L.P., L.K., M.G.), each with an established publication record in the sport-injury field or clinical rehabilitation experience. All of the items were informed by previous literature suggesting that athletes may do too much in their rehabilitation, may be overly keen to return to their sport, or may perform rehabilitation exercises beyond the frequency, duration, or intensity prescribed by the athletic trainer.^{4,5} Research^{6,7} suggesting that some athletes may push past recommended pain limits or disregard the athletic trainer’s guidelines also informed the development of the ROAQ items. Because no previous attempts have been made to develop specific items relating to overadherence, the particular content and phrasing of all items was based on the authors’ knowledge of the literature and their clinical and research experience with injured athletes. Initially, the 3 authors with clinical rehabilitation experience independently devised items based on the most commonly observed behaviors and cognitive and affective statements made by athletes during rehabilitation sessions. Next, all 3 research practitioners discussed item content, clarity, and relevance in a meeting. Only those items that were agreed upon by all 3 research practitioners were retained for preliminary analysis. One item (“I take pain medication not prescribed to me in order to expedite my rehabilitation”) was eliminated because athletes may not be inclined to divulge illegal activities. After the items were generated, 4 practicing certified athletic trainers (National Collegiate Athletic Association Divisions I–III) with master’s or doctoral degrees in sport psychology reviewed the items for content, clarity, and format. Expert feedback was used to revise the draft measure and provide an initial assessment of content validity. All 4 experts believed that the 19 items were indicative and representative of the spectrum of overadherence beliefs and behaviors they had observed in their clinical practice. As described below, construct validation of the ROAQ was assessed using PAF and CFA. A summary of PAF results with items from the final ROAQ inventory is provided in Table 1. Responses for the rehabilitation behavior items were recorded on a 5-point Likert scale with anchor statements 1 (*Never*) to 5 (*Always*). A statement stem (ie, “How frequently do you . . .”) prefaced items assessing the behavioral aspects of overadherence (eg, “. . . perform more rehabilitation exercises than your athletic trainer recommends,” or “. . . ignore your athletic trainer’s recommendations to avoid specific exercises or activities”). Responses for the cognitive aspects of overadherence were

Table 1. Principal Component Analysis of the Rehabilitation Overadherence Questionnaire

Response Item	Factor	
	1	2
Ignore practitioner recommendations (6 items)		
Ignore your athletic trainer's advice to avoid pushing through unwanted pain	0.65	-0.01
Ignore your athletic trainer's recommendations to avoid specific exercises or activities ^a	0.72	-0.02
Avoid reporting pain to your athletic trainer	0.69	0.05
Hide pain about your injury from doctors or other rehabilitation experts	0.71	-0.12
Ignore your athletic trainer's recommendations to avoid "doing too much too soon" in your rehabilitation	0.57	0.06
Think that my family or teammates are concerned that I ignore my athletic trainer's advice to limit the rehabilitation exercises I perform	0.59	0.17
Attempt an expedited rehabilitation (4 items)		
Try to catch up with other athletes who are further ahead in their rehabilitation	0.23	0.41
Think it is usually better to do too much rehabilitation than not enough	-0.10	0.73
Perform more rehabilitation exercises than your athletic trainer recommends	0.07	0.55
Believe I must progress as quickly as possible in order to avoid losing physical fitness	-0.00	0.58
Variance, %	37.73	15.44

^a *Athletic trainer* can be replaced with the term *athletic therapist* or *sport physiotherapist* for non-US contexts. Values in boldface indicate a factor loading greater than 0.40.

also recorded on a 5-point Likert scale with anchor statements 1 (*Strongly disagree*) to 5 (*Strongly agree*). A statement stem, "In thinking about my rehabilitation I..." prefaced cognitive items (eg, "... think it is usually better to do too much rehabilitation than not enough," "... believe I must progress as quickly as possible in order to avoid losing physical fitness").

Modified Injury Psychological Readiness to Return to Sport Scale (I-PRRS). Glazer¹⁹ developed the 6-item I-PRRS to assess athletes' psychological readiness to return to sport after injury. We amended the questionnaire to assess athletes' willingness to risk premature return to sport. In the original scale, athletes are asked to rate their confidence to return to sport on a scale from 0 (*No confidence at all*) to 100 (*Complete confidence*) with sample items including, "My overall confidence to play is..." and, "My confidence to play without pain is..." Preliminary evidence indicated acceptable reliability (α ranging from .78 to .93 at 4 data-collection time points) and external and construct validity. Items were modified to examine the extent to which athletes would be willing to risk a premature return to competition. In particular, the words "was low" were added to the end of each statement (eg, "My overall confidence to play was low," "My confidence to play without pain was low"). Items were measured on a 5-point Likert scale with anchor statements ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). A statement stem (eg, "I would return to competition even if my...") prefaced all items. The internal reliability of the scale in the present study was 0.90.

Procedures

After we received approval of the study from the Human Research Ethics Committee, we contacted coaches and certified athletic trainers throughout Texas to inform them of the study purposes. All athletes and parents were provided with information sheets regarding the purposes of the study, and informed consent and assent was obtained. In most instances, data were collected in team meetings, practices, and weight-training sessions organized by the head coach or the team's certified athletic trainer. Athletes

returned parental consent forms at these meetings and completed questionnaires. A trained research assistant administered questionnaires and informed participants that study involvement was completely voluntary, and they were free to withdraw at any time. Coaches or athletic trainers were asked to leave the room during questionnaire completion, and participants were assured of confidentiality. In other instances, coaches and athletic trainers were sent an e-mail that included the study questionnaire, parental consent forms, and participant assent forms. The coaches or athletic trainers asked athletes to have parents complete the parental consent form and return it with the questionnaire. Adolescents returned consent and assent forms separately from unsigned questionnaires; the latter were returned in sealed envelopes. Thus, coaches and athletic trainers had no knowledge of the athletes' responses when the completed questionnaires were mailed to the first author (L.P.). Those who scanned and e-mailed questionnaires to the first author provided assurances to their athletes and the first author that they would not examine the athletes' responses. As indicated earlier, to avoid recall bias and memory loss effects, we studied only athletes who were currently injured at the time of their study participation. Lastly, no incentives for study participation were given.

Data Analyses

Data analysis occurred in 3 stages. The first analyses were designed to reduce the 19-item ROAQ into relatively few interpretable factors. An integrated PAF method with varimax rotation was conducted on the responses to the 19-item questionnaire. This method is commonly used in the social and behavioral sciences; we chose it over principal component analysis because PAF attempts to understand the shared variance in a set of measurements through a small set of factors, whereas principal component analysis attempts to understand all the variance in the variables with a discrete number of factors.²⁰

The second stage of analysis involved descriptive and bivariate correlational examination of the study variables. In these analyses, an item average score for the self-

Table 2. Descriptive Statistics, Internal Reliabilities, and Correlations for the Measures^a

Measure	1	2	3	4	5	6	7	8
1. Appearing athletically untalented	—	0.38 ^b	0.50 ^b	0.55 ^b	-0.04	0.05	0.12	0.04
2. Physical appearance	0.53 ^b	—	0.55 ^b	0.63 ^b	0.15	0.26 ^b	0.36 ^b	0.15
3. Fatigued/lacking in energy	0.48 ^b	0.56 ^b	—	0.73 ^b	-0.01	0.16	0.22 ^c	0.17
4. Mental composure inadequacies	0.59 ^b	0.55 ^b	0.53 ^b	—	0.02	0.13	0.31 ^b	0.18
5. Athletic Identity Measurement Scale	0.02	0.09	0.07	-0.08	—	0.08	0.27 ^b	0.18
6. Premature return to sport	0.18 ^b	0.03	0.13	0.12	0.05	—	0.14	0.08
7. Ignore practitioner recommendations	0.29 ^b	0.20 ^c	0.28 ^b	0.18	0.23 ^c	0.09	—	0.58 ^b
8. Attempt expedited rehabilitation	0.11	-0.01	0.09	-0.07	0.46 ^a	0.15	0.49 ^b	—
Mean ± SD								
Adolescent sample (n = 118)	2.13 ± 0.90	1.68 ± 0.74	2.11 ± 1.06	1.80 ± 0.67	5.67 ± 0.90	3.30 ± 0.94	2.01 ± 0.86	3.11 ± 0.78
Collegiate sample (n = 105)	2.02 ± 0.97	1.61 ± 0.73	2.23 ± 0.84	1.72 ± 0.77	5.63 ± 0.96	3.13 ± 0.90	2.11 ± 0.78	3.03 ± 0.84

^a Correlations for the collegiate sample appear above the dashes. Correlations for the adolescent sample appear below the dashes.

^b $P < .01$.

^c $P < .05$.

presentation subscales (eg, appearing athletically untalented, physical appearance, mental composure inadequacies, and appearing fatigued/lacking energy) and the AIMS was created. The SPSQ subscales and AIMS (ie, the independent variables) were then correlated with the dependent variables: rehabilitation overadherence and willingness to risk a premature return to sport. These correlations provided an indication of the strength and direction of the relationships between self-presentational concerns, athletic identity, and overadherence and risking a premature return to sport. Finally, multiple regression analysis was conducted to evaluate the unique contribution of each type of self-presentational concern and athletic identity to predicting the 2 outcome measures. Stevens²¹ recommended a nominal number of 15 cases per predictor for multiple regression analyses, so our sample size of 118 participants was deemed sufficient.

RESULTS

Principal Axis Factoring of the ROAQ

The initial 19-item PAF revealed a 4-factor solution. After investigating the loadings of the items, 9 items were eliminated from further PAF. However, in PAF, only the first 2 factors displayed eigenvalues greater than 1. Thus, only 2 components, containing a total of 10 items, were kept for rotation. Seven of the 10 items were derived from the behavioral subscale, and 3 items were from the cognitive subscale. Together, factors 1 and 2 explained 53.17% of the total variance. The questionnaire items and corresponding factor loadings are shown in Table 1. In interpreting the rotated factor pattern, a loading of 0.40 or greater was used to identify items to factors.²² According to this criterion, 6 items loaded on the first factor (loadings from 0.57 to 0.72), which was subsequently labeled *ignore practitioner recommendations* (IPR, $\alpha = .83$), and 4 items loaded on the second factor (loadings from 0.41 to 0.73), labeled *attempt an expedited rehabilitation* (AER, $\alpha = .70$).

Descriptive Analyses

The descriptive statistics and Pearson product moment correlations among the study variables are provided in Table 2. In general, adolescents displayed relatively high levels of athletic identity and moderate levels of willingness to make a premature return to sport; the mean scores of these variables were above the midpoint of the scale (ie, 5.67 for AIMS and 3.30 for willingness to return prematurely). However, adolescents reported relatively low levels of self-presentational concern (SPSQ range = 1.68–2.13) and moderate to low levels of overadherence (ie, 2.01 for ignoring practitioner recommendations and 3.11 for attempting an expedited return). Correlation analyses revealed that all the SPSQ subscales were significantly positively related to one another (all P values $< .01$; Table 2). The AAU was positively associated with willingness to risk a premature return to sport ($r = .18$, $P < .05$) and ignore practitioner recommendations ($r = .29$, $P < .01$). Concerns over physical appearance and appearing fatigued/lacking in energy were also associated with the tendency to ignore practitioner recommendations ($r = .20$, $P < .05$ and $r = .28$, $P < .01$, respectively). Moreover, athletic identity was positively correlated with the 2 rehabilitation overadherence factors (ie, ignoring practitioner recommendations: $r = .23$, $P < .05$; attempting an expedited return: $r = .46$, $P < .01$). Finally, the 2 factors of rehabilitation overadherence were positively associated with each other ($r = .49$, $P < .01$). No other significant correlations were found.

Regression Analyses

Simultaneous multiple regression analyses were conducted to investigate the predictive utility of the 4 self-presentation concern variables and athletic identity on the outcome variables. Concerns about appearing athletically untalented (AAU) and athletic identity (AIMS) emerged as significant positive predictors for ignoring practitioner recommendations, accounting for 15% of the variance (Table 3). Additionally, athletic identity was a significant

Table 3. Results of Regression Analyses

Dependent	Variables Independent	Adolescent Sample			Collegiate Sample		
		R ^{2a}	β ^b	t	R ²	β	t
Premature return to sport	1. Appearing athletically untalented	0.05	0.19	1.56	0.08	-0.06	-0.49
	2. Physical appearance		-0.15	-1.25		0.27	2.10 ^c
	3. Fatigued/lacking in energy		0.10	0.84		0.09	0.63
	4. Mental composure inadequacies		0.04	0.33		-0.08	-0.47
	5. Athletic Identity Measurement Scale		0.05	0.57		0.04	0.36
Ignore practitioner recommendations	1. Appearing athletically untalented	0.15	0.22	1.91 ^c	0.20	-0.06	-0.52
	2. Physical appearance		-0.03	-0.24		0.23	1.96 ^c
	3. Fatigued/lacking in energy		0.18	1.61		-0.03	-0.21
	4. Mental composure inadequacies		-0.02	-0.15		0.21	1.39
	5. Athletic Identity Measurement Scale		0.21	2.41 ^c		0.23	2.52 ^d
Attempt expedited rehabilitation	1. Appearing athletically untalented	0.25	0.19	1.79	0.07	-0.08	-0.71
	2. Physical appearance		-0.14	-1.32		0.02	0.14
	3. Fatigued/lacking in energy		0.11	1.02		0.11	0.74
	4. Mental composure inadequacies		-0.13	-1.11		0.13	0.83
	5. Athletic Identity Measurement Scale		0.45	5.30 ^d		0.17	1.70

^a R² values are cumulative, with each incremental step adding to the variance explained.

^b β values are standardized regression coefficients from the final stage of the regression analysis.

^c P < .05.

^d P < .01.

positive predictor for attempting an expedited rehabilitation, explaining 25% of the variance.

DISCUSSION

The purpose of study 1 was to provide initial validation of the rehabilitation overadherence questionnaire and to examine associations between self-presentation concerns, athletic identity, and 2 outcome measures: rehabilitation overadherence and willingness to risk a premature return to sport. Consistent with our first hypothesis, we found a 2-factor structure for the overadherence measure. However, rather than explicitly reflecting the behavioral and cognitive aspects of overadherence per se, the 2 subscales appeared to reflect the degree to which adolescents adopted rehabilitation recommendations and the extent to which they felt compelled to accelerate the rehabilitation process. The first factor, ignoring practitioner recommendations, is consistent with past research¹ suggesting that athletes may disregard or ignore medical practitioners' suggestions and guidelines. Effective communication, clear guidelines and expectations, education, and positive athletic trainer-athlete rapport may be instrumental in ensuring appropriate adherence levels and compliance with practitioner recommendations.^{4,23} The emergence of the second factor, attempting an expedited rehabilitation, is also consistent with athletic trainers' reports that some athletes may try to do too much too soon in their rehabilitation⁴ and suggests the need for practitioner strategies aimed at reducing excessive rehabilitation efforts. Further strategies for addressing injury-rehabilitation overadherence are articulated in the general discussion. As indicated above, having a valid and reliable overadherence measure will assist athletic trainers in identifying athletes who are potentially at risk for rehabilitation setbacks or compromised clinical outcomes.^{4,7} Additionally, identifying patients engaging in rehabilitation overadherence may alert athletic trainers to the need for psychosocial intervention (eg, reframing,

social support) or referral to another health care professional. The ROAQ questionnaire can be easily administered in the context of a rehabilitation session and, with the permission of athletes, may be used as a tool for discussing results and the importance of limiting rehabilitation overadherence.

In partial support of our second hypothesis, we found that self-presentation concerns—specifically, concern over appearing athletically untalented, physical appearance, and fatigued/lacking in energy—were associated with the tendency to ignore practitioner recommendations. These findings support contentions by Weise-Bjornstal et al⁹ that personal factors may influence athletes' responses to injury, in this case, rehabilitation overadherence. The correlations were relatively small, so future researchers should examine why self-presentation may account for the tendency to ignore practitioner recommendations. In addition, concern over appearing athletically untalented was associated with willingness to risk a premature return to sport. To our knowledge, these findings represent the first empirical evidence highlighting the relationship between self-presentation concerns and injured athletes' health-risk beliefs and behaviors. These results also support previous findings¹⁰ indicating associations between self-presentation concerns and maladaptive behaviors outside the sport-injury domain. In particular, these findings are consistent with the youth development literature suggesting that adolescent preoccupations with wanting to avoid looking bad in front of peers or worries about creating the wrong impression may be linked with health-jeopardizing practices.²⁴ Moreover, given past evidence^{7,25} indicating athlete apprehensions about regaining previous competitive levels and competencies, it is not surprising that of all the self-presentation concerns assessed, anxiety over appearing athletically untalented predicted the adolescents' inclination to ignore practitioner recommendations in the regression analyses. However, concerns about appearing athletically untalented

and athletic identity accounted for only 15% of the variance in the tendency to ignore practitioner recommendations. This suggests that other personal factors highlighted in the Wiese-Bjornstal et al⁹ model (for example, personality traits such as neuroticism) may play a role in athlete overadherence. This possibility coincides with the Niven^{4(p107)} findings that athletes with an “intense personality” may be more likely to overcomply. The low variance notwithstanding, the self-presentation results reinforce the need for rehabilitation specialists to provide opportunities for athletes to gain confidence in their physical abilities and technical skills before returning to competition.²³ The functional progressions commonly used in rehabilitation settings may be important in building adolescent efficacy regarding physical skills. Building confidence in physical and technical abilities may be particularly relevant for adolescents, many of whom feel a strong need to make desired impressions on relevant others.

Results from this investigation were also novel insofar as they highlighted the relevance of athletic identity in promoting rehabilitation overadherence. Consistent with previous research^{12,26,27} demonstrating the deleterious consequences of a high athletic identity, we found that identification with the athlete role was associated with reports of ignoring practitioner recommendations and attempting an expedited injury rehabilitation. To mitigate athletic identity effects, athletic trainers are encouraged to reframe injury rehabilitation as a form of athletic performance rather than an experience that negates the athlete’s reason for existence. Promoting the mindset that sport is something one does rather than the sum total of who one is may facilitate discussions about the negative consequences of overidentification with the athlete role. Cognitive reframing techniques are consistent with the National Athletic Trainers’ Association fifth-edition educational competencies,⁸ which require all athletic trainers to know psychosocial strategies for promoting optimal rehabilitation adherence and for facilitating athletes’ physical, psychological, and return-to-activity needs.

STUDY 2

In study 1, we used a PAF to discern a 2-factor, 10-item measure of overadherence. In study 2, we sought to provide further validation of the ROAQ factor structure using CFA and to confirm the study 1 findings regarding associations between self-presentation concerns, athletic identity, overadherence, and willingness to risk a premature return to sport in a collegiate sample. This sample was selected for study 2 to determine whether replication of the correlational findings and the factor structure of the overadherence measure would be observed among college-aged participants.

METHODS

Participants

A total of 105 currently injured collegiate athletes (male = 62 [59%], female = 43 [41%]) competing in a range of NCAA Division I–III sports from the United States participated in the study. Athletes competed in the following varsity and club-level sports: football (n = 22, 21%), basketball (n = 16, 15%), soccer (n = 11, 11%),

volleyball (n = 9, 9%), track and field (n = 4, 4%), baseball (n = 17, 16%), softball (n = 3, 3%), cheerleading/gymnastics (n = 9, 9%), tennis (n = 5, 5%), golf (n = 1, 0.9%), rugby (n = 1, 0.9%), swimming (n = 2, 2%), lacrosse (n = 2, 2%), and snowboarding (n = 2, 2%). One athlete did not report a specific sport. Eligibility criteria were applied as in study 1, except that athletes had to be participating at the collegiate level. Participants self-reported an average of 14.06 ± 6.14 hours per week in sport training before injury occurrence (range = 1–30 hours) and had competed in their current sport for an average of 9.74 ± 4.60 years (range = 1–20 years). A wide variety of injuries (eg, torn anterior cruciate ligament, n = 18, with 16 requiring surgery; fractured humerus, femur, or clavicle: n = 15, with 5 requiring surgery; shoulder dislocation: n = 9, with 6 requiring surgery; sprain: n = 8, with none requiring surgery) were reported, and 53 athletes (50.5%) required surgery for their injury. The average length of time participants were unable to participate as a consequence of injury was 2.49 ± 2.10 months (range = 0.5–7 months). All participants received treatment from certified athletic trainers.

Instruments

The same questionnaires described in study 1 were used in study 2. For the collegiate athletes, we used the original SPSQ items reported by McGowan et al¹⁴ rather than the modified version administered to the adolescents. Strong internal reliabilities were observed in study 2 for all study variables (AAU: $\alpha = .93$, PA: $\alpha = .87$, FLE: $\alpha = .97$, MCI: $\alpha = .88$, AIMS: $\alpha = .78$, premature return: $\alpha = .91$, IPR: $\alpha = .86$, AER: $\alpha = .75$).

Procedures

After receiving approval of the study from the Human Research Ethics Committee, the third (L.K.) and fourth (J.K.) authors recruited athletes from 2 tertiary institutions. Following informed consent procedures, athletes completed questionnaires in the athletic training room during physiotherapy sessions when they had the time and privacy to do so. Data were also collected by a research assistant from a third university in the southwest part of the United States. These questionnaires were administered at team training and physiotherapy sessions, and all athletes were assured confidentiality of responses. In all instances, the third or fourth author or the research assistant was at the data-collection site to inform participants of confidentiality procedures. Specifically, participants were told to put the questionnaires in a sealed envelope and that responses would not be shared with anyone other than the lead researcher, nor would athletes be identified by name in any publication or reporting of results. The third and fourth authors, both of whom had research experience and substantial knowledge of informed consent procedures, mailed the questionnaires to the first author (L.P.). The research assistant also hand delivered questionnaires to the first author. Upon receipt, the consent forms were separated from the questionnaires, and a code was assigned to each questionnaire so that no athletes were identified by name during the data-entry process.

Data Analyses

Data analysis followed a similar procedure as in study 1. First, CFA was conducted using the 10 items that emerged from the PAF with the adolescent sample. Specifically, the 6 IPR items and 4 AER items emerging from the PAF in the adolescent sample were used in the CFA with the collegiate sample. Second, descriptive and bivariate correlations were calculated using the 4 self-presentation subscales, athletic identity, and 2 dependent measures (ie, overadherence subscales and risking a premature return to sport). Last, multiple regression analysis was used to evaluate the unique contribution of each type of self-presentational concern and athletic identity to predicting overadherence or risking a premature return to sport.

RESULTS

Confirmatory Factor Analyses of the ROAQ

A CFA was conducted on items measuring rehabilitation overadherence to further examine the construct validity of these measures. We used 4 indices to determine the goodness of fit: (a) χ^2 and χ^2 by degrees of freedom, (b) the comparative fit index, (c) the goodness-of-fit index, and (d) the root mean square error of approximation. A nonsignificant χ^2 indicates the model is an acceptable fit to the data. Values larger than 0.90 for (a) and (b) and less than 0.08 for (c) indicate good model fit.^{28,29}

This 2-factor model was confirmed with the adolescent sample via PAF in study 1. Because participants in this study were college students, we conducted a CFA to examine whether the 2-factor model fit our data. The CFA was conducted using the SAS (version 9.1; SAS Institute Inc, Cary, NC) PROC CALIS procedure, in which the data were entered as a covariance matrix. Maximum likelihood procedures were used, and the items were allowed to correlate freely with one another. In this study, χ_{34}^2 ($n = 105$) = 35.84, $P = .38$, comparative fit index = .99, goodness-of-fit index = .94, and root mean square error of approximation = .05, indicating an acceptable fit between the 2-factor model and our data. Based on the results of the CFA, we constructed scales of *ignore practitioner recommendations* and *attempt an expedited rehabilitation* by averaging the items on the 2 subscales. Cronbach α coefficients for the 2 scales were 0.86 and 0.75, respectively, demonstrating acceptable internal reliability. Taken together, these results indicate that the measures—ignore practitioner recommendations and attempt an expedited rehabilitation—produced reliable and valid scores.

Descriptive Analyses and Regression Analyses

As shown in Table 2, the descriptive statistics for the college sample followed the same patterns as for the adolescent sample. Correlation analyses also demonstrated patterns that were relatively consistent with those of the adolescent sample, although a number of differences emerged. Specifically, all the SPSQ subscales were positively related to one another ($P < .01$). Also, the 2 rehabilitation overadherence subscales, ignoring practitioner recommendations and attempting an expedited rehabilitation, were positively associated with each other ($r = 0.58$,

$P < .01$). Concerns about PA were positively associated with willingness to risk a premature return to sport ($r = 0.26$, $P < .01$) and ignoring practitioner recommendations ($r = 0.36$, $P < .01$). Concerns about FLE, MCI, and athletic identity were also positively related to ignoring practitioner recommendations ($r = 0.22$, $P < .05$; $r = 0.31$, $P < .01$; $r = 0.27$, $P < .01$, respectively). No other significant correlations were found.

Regression analyses revealed that PA concerns emerged as the only significant predictor for college athletes' willingness to risk a premature return to sport, accounting for 8% of the variance (Table 3). Physical appearance and athletic identity emerged as the positive predictors for ignoring practitioner recommendations, explaining 20% of the variance.

GENERAL DISCUSSION

Overall, the findings from studies 1 and 2 provide evidence of construct validity and internal reliability of the ROAQ, suggesting that it is a valid and reliable instrument for use in research and applied settings. One cautionary note relates to the internal reliability score of the attempt-an-expedited-rehabilitation subscale found in study 1. Although the α value (.70) met the Nunnally³⁰ minimum internal reliability criteria, associations with this subscale should be interpreted with care. Further research is needed to determine the internal consistency and test-retest reliability of the attempt-an-expedited-rehabilitation items. In addition, we recommend that further psychometric testing of the overadherence measure use the statement stem, "To what extent do you ..." in prefacing overadherence items. Doing so will enable the 2 overadherence factors, ignoring practitioner recommendations and attempting an expedited rehabilitation, to be examined using a single stem.

Findings from the 2 investigations also suggest that athletes with self-presentational concerns and a high athletic identity may be at greater risk of engaging in risky rehabilitation behaviors, specifically rehabilitation overadherence and willingness to risk a premature return to sport. Both studies revealed that PA and FLE concerns were associated with the tendency to ignore practitioner recommendations. In study 2, MCI was also associated with the inclination to ignore practitioner recommendations, whereas PA concerns were associated with willingness to risk a premature return to sport. Of interest is that AAU concerns were predictive of adolescents' willingness to ignore practitioner recommendations, whereas PA concerns predicted the tendency to ignore practitioner recommendations and to risk a premature return among the collegiate athletes. This dissimilarity may speak to developmental differences between the age groups. Collegiate athletes are, in general, deemed athletically talented by virtue of the fact that they have endured the Darwinian "survival of the fittest" to become members of an athletic team. Consequently, AAU concerns may be less of a worry for this population than adolescents. However, anxiety about PA may become more salient at higher levels, given the increasing physical homogeneity prevalent among elite-level athletes.³¹ Such homogeneity could cause collegiate athletes to focus more on a desire to preserve muscle mass or physical physique and therefore try to return prematurely

to stay fit. Further research is needed to explore self-presentational predictors of overadherence and risking a premature return among injured athletes of different age groups and competitive levels. Moreover, the fact that PA concerns only accounted for 8% of the variance in collegiate athletes' willingness to risk a premature return suggests the need to examine other factors that may influence a premature return.

Collectively, the results involving self-presentation from studies 1 and 2 support previous research: intrapersonal factors highlighted in the Wiese-Bjornstal et al⁹ model, such as self-efficacy, self-motivation, and personal coping, have been associated with rehabilitation adherence.^{32,33} These findings also lend further credence to the contention that athletes who are worried about making desired impressions on others may engage in compensatory efforts by overadhering to their injury rehabilitation. Longitudinal research is needed to examine whether rehabilitation overadherence ultimately leads to negative consequences such as poor clinical rehabilitation (eg, insufficient physical healing, poor proprioception, muscular strength) and diminished return-to-sport outcomes (eg, reduced confidence in return to play abilities, poor postinjury performances).

Once again, athletic identity emerged as a significant predictor of rehabilitation overadherence in study 2, further indicating its relevance in predicting potentially maladaptive outcomes. This finding supports previous research demonstrating associations between athletic identity and negative consequences such as depression after injury,¹² sport aggression,²⁶ and anxiety in career decision making.²⁵ Consistent with explanations in previous studies, it seems likely that injured athletes who overidentify with the athlete role may feel compelled to resume the sport that defines them and satisfy a contingent sense of self-worth. Further investigation illuminating the reasons why highly identified athletes may be prone to excessive rehabilitation efforts would be beneficial; qualitative investigations would be particularly useful toward this end.

PRACTICAL IMPLICATIONS

Given that self-presentation concerns and athletic identity predicted risky rehabilitation behaviors in studies 1 and 2, athletic trainers would be wise to identify these traits in injured athletes to try to reduce the likelihood of injury-risk behaviors. Rehabilitation practitioners may use the SPSQ and AIMS to predict those at risk. Both questionnaires can be easily administered, scored, and analyzed within 5–10 minutes, so they are well suited for clinical settings. Moreover, should injured athletes present with high levels of self-presentational concerns or reveal a high athletic identity, a number of strategies may prove effective in addressing these issues. For instance, self-presentation and athletic identity concerns could be minimized through *cognitive reframing*, which is a process of creating alternative frames of reference or different ways of assessing a situation.³⁴ Athletic trainers may help injured athletes reframe their perspective by shifting the focus to the intrinsic reasons for their sport involvement, such as love of the game, personal feelings of satisfaction in learning new skills, the thrill and excitement of sport participation, and the social benefits of sport involvement.

Motivational interviewing, a strategy in which individuals are encouraged to contemplate their personal motives for engagement in an activity or desire for behavior change, may be effective in focusing athletes' attention on their intrinsic motives to return to sport. Markland et al³⁵ provided a more detailed discussion of the technique. Additionally, a focus on nonsport-related aspects of the self may help reframe the salience of one's athletic identity relative to other roles and identities. For instance, ongoing discussions about various nonsport activities that provide meaning and fulfillment in athletes' lives should be promoted and encouraged. Goal-setting techniques may also be beneficial in minimizing the relevance of self-presentational concerns. Focusing on process- or task-related goals (eg, technical adjustments or particular times on fitness tests) that are self-referent in nature and under the athlete's control may be useful.³⁶ Setting goals that are specific, measurable, attainable, self-determined, and regularly evaluated may focus athletes' attention to rehabilitation aspects under their control and away from concerns about attaining desired evaluations from others. Importantly, athletic trainers should emphasize that goals must remain flexible, depending upon rehabilitation progress and setbacks. Lastly, self-presentational concerns may be minimized by ensuring athletes opportunities to experience competence in performing rehabilitation exercises, providing a strong relational base (ie, connection and support from the athletic trainer) and promoting autonomous (ie, volitional) motives for returning to sport. Ultimately, the extent to which practitioners employ such strategies may reflect the number of injured athletes engaging in risky rehabilitation behaviors. Moreover, in accordance with their educational competencies,⁸ it is important for athletic trainers to appreciate that the aforementioned strategies fall within the scope of their practice. Further research examining the efficacy of the aforementioned strategies in reducing the likelihood of maladaptive rehabilitation behaviors is needed.

Despite the novel findings emerging from study 1 and 2, as well as the development of the overadherence measure, several limitations exist. First, the cross-sectional nature of both studies makes it impossible to determine cause-effect relationships. Longitudinal studies assessing baseline measures of self-presentation concerns and athletic identity at injury onset would be useful for predicting subsequent risk behaviors. Second, as indicated above, although the attempt-an-expedited-rehabilitation subscale met the Nunnally³⁰ internal reliability criteria, further validation of this subscale is needed before its continued use can be advocated. Third, differences in sex, injury types, sports (eg, football versus swimming), and receipt of treatment from health practitioners may have influenced self-presentational concerns and athletic identity that could, in turn, influence overadherence or the willingness to risk a premature return to sport. Researchers should examine potential demographic and injury-specific differences. Fourth, small sample sizes may have limited the number of positive relationships found in the 2 investigations. Future authors should study larger samples in an effort to replicate and extend findings from these studies.

These limitations notwithstanding, the findings from studies 1 and 2 provide preliminary validation of a novel injury-overadherence measure and suggest 2 important

factors highlighted in the Wiese-Bjornstal et al⁹ model that likely affect injured athletes' risk behaviors and beliefs. Further exploration of the dynamics and underlying correlates of rehabilitation overadherence and risking a premature return to sport is needed to ensure a safe and successful injury rehabilitation and return to competition.

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