

The Development of a Measure of Psychological Responses to Injury

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Objective: The current paper reports the initial development of a theoretically derived measure to assess the psychological responses of injured athletes. **Design:** The paper comprises two studies. The first examines the factorial validity of the Psychological Responses to Sport Injury Inventory (PRSII) originally reported by Evans, Hardy, and Mullen.¹ The second reexamines the factorial validity of the PRSII following scale refinement. Confirmatory factor analysis was employed in both studies. **Setting:** Sport injury clinics. **Participants:** Study 1 comprised repeated observations ($n = 486$) on 56 injured athletes. Study 2 comprised single observations on 418 injured athletes. **Measure:** Psychological Responses to Sport Injury Inventory (PRSII). **Results:** The five factor model from the first study demonstrated variable model fit. The six factor model that emerged from the second study showed improved model fit. **Conclusions:** The study provides some support for the PRSII as a measure of athletes' psychological responses to injury. **Keywords:** rehabilitation, recovery.

Researchers have employed a variety of strategies in their pursuit of greater knowledge and understanding of athletes' psychological responses to injury and the factors that affect these responses. These strategies have comprised both qualitative and quantitative approaches, with researchers utilizing surveys, questionnaires, and interviews for data collection purposes; however, within the quantitative research, a dearth of appropriate measures by which athletes' responses to injury may be accurately assessed has necessitated a reliance on nonpopulation specific measures.¹⁻³

The findings that have emerged from the quantitative research has suggested that injured athletes experience a range of negative emotions, including heightened levels of tension, depression, anger, and confusion.⁴⁻⁷ Some of the findings must be treated with caution, however. In the majority of the studies, the Profile of Mood States (POMS) has been utilized as the primary measure in conjunction with measures of, for example, anxiety, self-esteem, and depression. This situation is less than satisfactory because although some of the measures utilized may have some relevance to the psychological responses of injured performers, none were developed to measure or predict variables derived from any psychological response

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model of injury. As a result, they may lack content and predictive validity.^{8,9} Indeed, as Anastasi¹⁰ asserts, the same test when employed for different purposes and/or with different subject populations should be validated in different ways, hence a measure that has high validity in predicting a particular criterion in one population may have little or no validity in another. The mood states assessed by POMS in part may be relevant to the population of injured performers, but they are unlikely to adequately represent the domain of psychological responses to injury. Indeed, a number of psychological responses to injury have been reported in the qualitative literature that are not accounted for by POMS (eg, shock, fear, isolation, frustration, impatience, confidence, attempts to rationalize¹¹⁻¹⁴). The development and use of appropriate injury specific measures is essential if we are to assess relevant constructs and address significant research questions.^{2,3}

A key feature of psychological responses to injury, and one supported particularly by qualitative research, is their transient nature.¹²⁻¹⁵ Although the importance of this feature has been acknowledged by a number of researchers,^{3,9,12,14} it has received limited attention. Research that has attempted to examine the temporal pattern of psychological responses to injury has generally supported a move from negative to positive affect over time.^{5,7,16,17} In line with this, some researchers have suggested a global mood disturbance, with simultaneous elevations in a number of negative mood state variables.^{7,18} There has been less support for an oscillation between highs and lows during the rehabilitation period. These findings, however, must be viewed within a methodological context. Much of the research to date has been characterized by considerable variability in the sampling of specific time phases, which has ranged from twice weekly⁵ to fortnightly intervals.⁷ Equally variable has been the proximity of the first data collection point relative to injury occurrence. Unfortunately, some of the research that has sampled distinct time phases across the injury period has shown little regard for the clinical literature in relation to the onset and duration of responses proposed to be invoked by a significant loss.¹⁹

The temporal nature of psychological responses to injury is an important issue in injury research generally, and in the current study specifically, because of its methodological implications. Emotional states are never static; they change in both quality and intensity. In order to capture this process of change and the factors that contribute to it, the same person needs to be observed on a number of occasions.²⁰ Unfortunately, this dynamic process-oriented approach to emotional states is the exception rather than the rule, and all too often, such states are treated as static phenomena.²¹ A process-oriented approach to the study of changing states is known as an intraindividual perspective. In contrast to an interindividual approach that involves comparisons of one person against another, an intraindividual perspective involves the repeated assessment of the same person again and again at different points in time. Unfortunately, according to Aldwin,²² reliance upon interindividual comparisons in process-orientated research has meant that researchers have frequently failed to answer important questions with regard to change. Aldwin²² also asserted that the temporal features of any study involving health outcomes should guide the choice of measure. This is not as straightforward as it may seem, however. One of the major difficulties arises from expecting process measures that are usually designed for applied settings to stand up to the same criteria as personality

measures.^{22,23} Not only do these two types of measure have different purposes, but also process instruments are designed to tap variability and change, making them almost by definition unreliable. Further difficulties in the design of such measures result from the inevitability of smaller sample sizes.²¹ Proponents of an intraindividual approach to developing psychometric process-oriented instruments argue that the merit of such measures is that they can be utilized for both intraindividual and interindividual comparisons, particularly if during development both types of approaches have been employed.^{21,23}

The preceding discourse has identified two important issues that underpin current and future research into psychological response to injury: (1) the need for population specific measures to assess the psychological responses of injured athletes, and (2) the need to account for the transient nature of athletes' psychological responses by adopting both intraindividual and interindividual approaches in measure development. The purpose of the current paper is to go some way to addressing these issues by reporting two stages in the development of a theoretically derived measure that can be used to examine athletes' psychological responses to injury within a temporal context. Evans et al¹ reported the initial development of the Psychological Responses to Sports Injury Inventory (PRSII), using exploratory factor analysis. The first phase of development involved the generation of a pool of items ($N = 108$) representative of the response characteristics of injured athletes based on a review of the clinical, medical, and sport psychology literature. To ensure content and face validity the pool of items was subsequently scrutinized by a panel of sport psychologists ($N = 6$) who possessed appropriate subject expertise. As a result of this process, 80 items were retained within a measure that was administered to athletes within 24 hours of injury occurrence and at three-daily intervals for the duration of their injury ($N = 22$, observations = 218). Exploratory factor analysis using principal axis factoring resulted in the development of a 25-item measure that comprised five subscales: Devastation, Dispirited, Reorganization, Feeling Cheated, and Restlessness. Cronbach alpha's for the subscales ranged from .75 to .86. The items in the subscale Devastation reflected feelings of shock and emptiness, which have frequently been reported to characterize athletes' responses to injury.^{5,24} The highest loading items in the subscale Dispirited represented feelings of apathy and lack of motivation, which contained connotations of frustration. The injury and clinical psychology literature provides support for such responses in the context of a significant loss (eg, goal directed behavior¹⁹). Perhaps implicit with any model of psychological response to injury is reorganization and recovery. The items within this subscale clearly reflected constructs central to this process (eg, confidence), ones which have been evidenced in a number of studies.^{11,25} The subscale labels of Feeling Cheated and Restlessness best accounted for the despair and agitation associated with the items in these two subscales. Although there is some support in the research literature for these subscales as response characteristics of injured athletes,²⁶ the absence of further support may in part be a function of the measures used; however, despite providing some preliminary support for the PRSII as a measure of athletes' psychological responses to injury, further validity research is necessary to provide support for the construct validity of the PRSII prior to its use in both research and applied contexts.

Study 1

The purpose of the first study was to examine the factor structure of the 25-item (5-factor) PRSII reported by Evans et al¹ using confirmatory factor analysis. Confirmatory factor analysis was used because of its potential for model generation, refinement, and confirmation.^{27,28} The data for the study were derived using an intraindividual approach.

Method

Participants and Procedure

A sample of performers who had sustained an injury that precluded participation in normal training and competition for a minimum period of five weeks completed the PRSII at five-day intervals for the duration of their injury ($M = 8.75$ weeks, $SD \pm 4.53$). All participants completed the measure at the required five-day interval. Participants ($N = 56$, male = 42, female = 14, observations = 486, $M = 8.68$, $SD \pm 4.5$, range = 23) were all involved in competitive sport ranging from club to representative level. Access to participants was gained via two sports injury clinics.

An initial meeting was conducted with all participants who met the injury criteria, to explain the nature of their proposed involvement in the study. Having completed a consent form, participants were provided with a completion schedule and a sufficient number of copies of the inventory to complete it at five-day intervals for the duration of their injury. In order to encourage adherence, the first author met with all participants on a weekly to fortnightly basis for the duration of their involvement in the study. No one who was approached and met the injury criteria declined to take part in the study. The use of multiple observations for participants in factor analysis enables the researcher to derive a factor structure that accounts for both individual difference and state pattern changes.²⁹ Mefferd³⁰ recommends that when adopting this procedure, the number of observations should exceed the number of variables (and be well over 100).

Data Analysis

The factorial validity of the measure was assessed by analysis of covariance structures using Lisrel 8²⁸ with maximum likelihood estimation. The method of maximum likelihood has been found to perform well under a variety of less-than-optimal conditions, including small sample size and excessive kurtosis.^{31,32} The sequential model testing approach was adopted to guide the analysis.^{27,33} This approach involves testing separate single factor models to assess the convergent validity of the subscale items prior to pairwise analysis of each pair of subscales to assess their pairwise independence. Finally, the whole model is tested. Prior to assessing model fit the data were inspected for skewness and kurtosis. Subsequently, parameter estimates were examined to check for a mis-specification in the model (cf. Byrne³⁴).

The adequacy of fit of each model was estimated using a number of fit criteria. Lack of consensus over the best indicator of model fit has led researchers to recommend the collective use of a number of fit indices. As a result, overall fit was assessed by the chi-square (χ^2) statistic and its associated p value, the root

mean square error of approximation (RMSEA)³⁵ and the associated test of close fit statistic,³⁶ the standardized root mean square residual (SRMR), the comparative fit index (CFI),³⁷ and the goodness of fit index (GFI).²⁸ Despite its sensitivity to non-normal data and sample size, the chi-square statistic and its associated p value are still considered an important indicator of model fit. A nonsignificant p value or a χ^2/df ratio of < 2.00 suggests a good model fit,^{34,36} although the larger the sample size the more likely that χ^2 will be significant.³² For the RMSEA, values close to .06 and a nonsignificant p value, and for the SRMR values less than .05 indicate very good model fit. A value close to 0.95 for the CFI and GFI indicates a good model fit.^{32,36} In addition to the indices of goodness of fit, the standardized residuals, completely standardized factor loadings, and the modification indices were examined to assess the fit of the models and to guide model respecification. The first phase of analysis involved the assessment of fit of the 25-item, 5 subscale PRSII reported by Evans et al;¹ subsequent analyses involved refinement of the original model.

Results

Examination of univariate skewness and kurtosis showed the items did not depart markedly from a normal distribution. However, Mardia coefficients revealed significant multivariate skewness ($z = 48.536$, $p < 0.01$) and multivariate kurtosis ($z = 24.734$, $p < 0.00$). Therefore, some caution is warranted in interpreting the results.

The analysis of the original 25-item 5 subscale measure provided less than adequate model fit in two of the original single factor models (Devastation and Reorganization), four of the pairwise analyses (Devastation and Reorganization, Devastation and Feeling Cheated, Reorganization and Feeling Cheated, Reorganization and Restlessness), and the final model ($\chi^2_{265} = 718.71$, $p = .00$, RMSEA = .061, RMSEA $p = .00031$, SRMR = .061, CFI = .81, GFI = .89). Examination of the standardized residuals, factor loadings, and modification indices resulted in the removal of one item from each of the five subscales. Factors were again analyzed singularly and pairwise, and subsequently a modified 20-item model was analyzed. This procedure resulted in good model fit being obtained from all single factor analyses (Table 1), and 7 of the 10 pairwise analyses (Table 2). The three pairwise analyses that did not achieve good model fit involved the subscale Reorganization. Because of the conceptual significance of this subscale in a model of injury response it was retained. The fit statistics for the full 20-item model were a little variable (Table 2). The RMSEA was less than .06 (and its associated p value was non-significant), and the SRMR was less than .05. Although the GFI was close to the recommended criterion to suggest a good fit, the CFI was only .89.

Comments

The purpose of the study was to assess the factor structure of the 25-item, 5-factor PRSII originally developed and reported by Evans et al.¹ As a result of confirmatory factor analysis a 20-item 5-factor model was generated. The latter model demonstrated adequate model fit for some of the fit criteria and provided some support for the PRSII as a measure of injured athletes' psychological responses. Bentler and Chou³⁸ suggest that maximum likelihood estimators are usually acceptable,

Table 1 Single Factor Fit Statistics and Factor Loadings

Factor / Items	Loading	χ^2	df	$p(\chi^2)$	RMSEA	RMSEA p value	SRMR	CFI	GFI
Devastation		2.63	2	.27	.026	.61	.018	.99	1.00
I am devastated by the injury.	.52								
I experience a feeling of emptiness.	.40								
I have difficulty accepting I am injured.	.28								
My world has fallen apart.	.40								
I feel a sense of sadness (item removed)									
Dispirited		.77	2	.68	.0	.88	.010	1.01	1.00
I am aggrieved at what has happened.	.42								
I feel a sense of apathy.	.38								
I lack motivation.	.50								
Socially I feel like an outcast.	.51								
I try to deny what has happened (item removed)									
Reorganization		2.37	2	.31	.020	.64	.019	1.00	1.00
I have much more confidence in myself.	.59								
I am beginning to feel like myself again.	.68								
I suffer from increased tension.	-.33								
I am seeking support from friends.	-.14								
Physically I feel a lot stronger (item removed)									
Feeling Cheated		4.44	2	.11	.050	.40	.025	.98	1.00
I can't help but feel bitter.	.53								
I cannot work out why my injury happened.	.23								
I have been cheated.	.42								
I feel as if I have been cheated by being injured	.42								
I question why it happened to me (item removed)									

Table 1 (continued)

Factor / Items	Loading	χ^2	df	$p(\chi^2)$	RMSEA	RMSEA p value	SRMR	CFI	GFI
Restlessness		1.89	2	.39	.0	.71	.016	1.00	1.00
I am unable to enjoy myself.	.31								
I am unable to relax.	.57								
I don't feel like mixing with other performers.	.70								
I am unusually anxious.	.50								
I get unduly upset about things unrelated to my injury (item removed)									

Table 2 Fit Statistics for Two-Factor Models and Full Model

Factors	χ^2	df	$p(\chi^2)$	RMSEA	RMSEA p value	SRMR	CFI	GFI
Devastation and Dispirited	39.45	19	.0039	.048	.53	.037	.94	.98
Devastation and Reorganization	59.74	19	.0000042	.067	.068	.044	.91	.97
Devastation and Feeling Cheated	37.77	19	.0064	.046	.60	.038	.96	.98
Devastation and Restlessness	52.44	19	.000057	.061	.17	.045	.94	.97
Dispirited and Reorganization	25.59	19	.14	.027	.93	.032	.98	.99
Dispirited and Feeling Cheated	27.53	19	.093	.031	.90	.033	.98	.98
Dispirited and Restlessness	44.63	19	.00077	.053	.37	.040	.95	.98
Reorganization and Feeling Cheated	64.13	19	.00000084	.071	.035	.058	.86	.97
Reorganization and Restlessness	64.44	19	.00000075	.071	.035	.048	.91	.97
Feeling Cheated and Restlessness	42.27	19	.016	.051	.44	.042	.95	.98
Full model: 20 item version	358.44	160	.0	.052	.31	.049	.89	.93

even when distributional assumptions are violated; however, in light of the slight skewness and kurtosis, the results of the present confirmatory factor analysis should perhaps be treated with some caution.

One of the advantages of confirmatory factor analysis is that it can guide model respecification when a hypothesized model does not demonstrate adequate model fit.³⁹ This process of respecification originally led to the removal of one item from each of the original subscales (see Table 1). The removal of an item from the subscales Devastation, Dispirited, and Reorganization was not considered to detract from the meaning attached to these subscales. However, the same was not felt to be true of the subscales, Feeling Cheated and Restlessness. In the latter case, in particular, there was concern about the extent to which the construct reflected the empirical research and indeed the items. Given the social context of one of the items, and in light of the role afforded isolation in some empirical research,^{26,40} it was felt that further clarification of the conceptual basis of the subscale was required. Specifically, whether the construct should be split to account for two separate constructs; isolation and feeling cheated.

The other substantive issue that emerged from the analyses involved the subscale Reorganization. Three of the pairwise analyses that did not achieve good model fit involved this subscale, and the modification indices suggested an improved model fit with the removal of this subscale; however, these findings were considered to reflect a limitation in the sampling procedures employed in this study that may have meant that the period of return to sport when athletes may “reorganize” and regain confidence, was not adequately accounted for in the data collection. Specifically, the final data collection point was at the athletes’ return to competitive sport. There is evidence to suggest that confidence restoration (and by implication Reorganization) is not experienced by athletes on initial return to sport, however. Rather, this process of confidence restoration can take around 6 weeks following athletes’ successful return to competitive performance.²⁵ Conceptually, Reorganization is of major importance in psychological response to injury research. Confidence, implicit within items in this subscale, is an important feature of athletes’ recovery from injury and re-entry into sport, as evidenced by a number of empirical studies (eg,^{12,25}). For the aforementioned reasons, the authors propose this subscale should be retained in future validity research.

Although this study provided some support for the PRSII as a measure of athletes’ psychological responses to injury, the results of the study identified a number of issues. These issues related to the conceptual basis/construct labeling of two of the subscales and sampling. The latter, it is acknowledged, may have partly resulted from the sampling of the latter phase of rehabilitation.

Study 2

The purpose of the second study was to address the limitations that emerged from the earlier study in relation to the construct and factorial validity of a measure of athletes’ psychological responses to sport injury. The interindividual approach adopted in this study was consistent with the need for the development of process-oriented measures that can be used for both intraindividual and interindividual comparisons and which are developed using both approaches.²¹

Method

Participants and Procedure

Participants were 418 injured athletes (322 male, 96 female) who had sustained an injury that precluded participation in sport for a minimum period of 2 weeks ($M = 28.37$, $SD 9.83$). The 2-week injury criteria employed in the present study (as opposed to the 5-week period adopted in the previous study) was intended to facilitate a larger sample size. Participation levels ranged from recreational to international. The measure was administered to participants at sports medicine clinics throughout the United Kingdom by the attending physician or physiotherapist. In order to adequately account for the various phases of injury and rehabilitation, an effort was made to ensure that sampling reflected different points in the injury process ranging from injury onset to return to sport. All participants completed a consent form and a modified 37-item version of the PRSII.

Based upon the previous analysis and with regard to empirical research, the PRSII was modified prior to data collection.^{14,40} Following a review of the relevant research literature a number of new items were generated to clarify the conceptual basis of the subscale Feeling Cheated and help to confirm the construct label, and a number of items were generated to clarify whether Restlessness reflected a single construct or whether two separate constructs (Restlessness and Isolation) might exist and indeed better account for athletes' responses. Because the subscales Dispirited and Reorganization contained an item that reflected a social context that it was felt might load on to a sixth hypothesized factor (isolation), additional items were generated to compliment the existing items within these two subscales. As a result, seven new items were generated for the subscales Feeling Cheated and Restlessness (and Isolation), one item for Reorganization, and two items for the subscale Dispirited.

Data Analysis

The factorial validity was assessed by analysis of covariance structures using Lisrel 8.²⁸ The sequential model testing approach was adopted to guide the analysis.^{27,33} The method of maximum likelihood was used to estimate parameters specified in the model and to test the goodness of fit of the data. All statistical analysis and diagnostic procedures were in accordance with those outlined in study 1.

Results

Examination of univariate and multivariate skewness and kurtosis showed the items to be normally distributed. In line with Jöreskog's²⁷ recommendations and consistent with the previous study, hypothesized single factor models were examined first to see if each factor measured a single latent variable. Factors were then analyzed pairwise and subsequently, a full six-factor model was tested. Based on the results of the single and pairwise analyses, model refinement involved removing items from some of the subscales to achieve the best model fit. Specifically, as hypothesized, the emergence of a sixth factor (Isolation) and the loading of one item from each of two of the existing subscales (Restlessness and Dispirited) on to Isolation

resulted in modified factor models for Restlessness and Dispirited (both contained a new item which had been hypothesized to reflect the constructs). One item in the Reorganization subscale cross-loaded on to Isolation and one cross-loaded on to a number of factors; a new item was included in the factor. The model for Devastation remained the same as in the previous study, and the improved fit statistics resulted from one item being replaced in the Feeling Cheated subscale. Following subscale modification, single factor models and subsequently pairwise factors were reanalyzed. As a result of this process, six subscales emerged from the data.

Following model refinement, factor loadings and fit statistics for all single factors were very good, with the exception of Dispirited (see Table 3). Of the 15 pairwise analyses, with the exception of the results for three of the analyses that involved Dispirited (ie, Dispirited and Devastation, Dispirited and Feeling Cheated, and Dispirited and Restlessness), which were a little weak, overall the fit statistics were good (see Table 4). In relation to the three pairwise analyses involving Dispirited, the χ^2 values were on the large size relative to the degrees of freedom, some of the values for the RMSEA were significant, and some of the CFI's were less than .95; however, the results for the GFI and SRMR were generally good. Because of variability in the adequacy of the fit statistics involving this subscale it was initially retained and a full six-factor model was analyzed. Overall, the six-factor model demonstrated less than adequate fit (see Table 4). The χ^2 was too large relative to the degrees of freedom, and despite an acceptable value for the RMSEA, the values for the SRMR, CFI, and GFI were all less than the recommended 0.95. Based on the results of the analyses and an examination of the modification indices and because the Dispirited subscale had been problematic at both the single factor and two-factor level, it was removed from the model and a five-factor model was tested. The adequacy of fit of this model was better. Specifically, the RMSEA was less than .06 and its associated *p* value non-significant, the SRMR was less than .05, the χ^2/df ratio was close to 2.00, and the CFI and GFI close to .95.

Comments

The purpose of the second study was to address the issues that emerged from the earlier study using an interindividual approach to data collection. Prior to data collection and based on the findings of the previous study, scale refinement involved generating a number of new items. These items were theoretically derived and as a result, hypothesized to load on specific factors. In the case of one factor, Restlessness, the process of item generation was intended to facilitate the splitting of that factor in to two conceptually distinct factors (Restlessness and Isolation). Following scale refinement procedures and as a result of confirmatory factor analysis, a 6-factor model and subsequently a 5-factor model were tested. The latter demonstrated adequate model fit and was considered conceptually sound.

In addition to the five factors reported in the previous study, as hypothesized, a sixth factor was generated from the analyses. The sixth factor, Isolation, contained two new items, plus one item that had previously been contained within the Restlessness subscale and one that had been contained within the Dispirited subscale. The items from the subscales Restlessness and Dispirited were the only items in those subscales that were characterized by a social dimension ("I don't like mixing with other performers" and "socially I feel like an outcast"). The emergence of

Table 3 Single Factor Fit Statistics and Factor Loadings

Factor / Items	Loading	χ^2	df	$p(\chi^2)$	RMSEA	RMSEA p value	SRMR	CFI	GFI
Devastation		9.13	2	.01	.10	.08	.03	.98	1.0
I have difficulty accepting that I am injured.	.56								
I am devastated by the injury.	.71								
My world has fallen apart.	.54								
I experience a feeling of emptiness.	.65								
Dispirited		26.75	2	.00	.17	.00	.05	.93	.97
I lack motivation.	.47								
I feel a sense of apathy.	.65								
I feel dispirited.	.79								
I get depressed about being injured.	.60								
Reorganization		Saturated – Perfect Fit							
I am feeling mentally stronger.	.59								
I am beginning to feel like myself again.	.46								
I have much more confidence in myself.	.75								
Feeling Cheated		1.59	2	.45	.00	.73	.01	1.0	1.0
I experience feelings of jealousy.	.59								
I cannot work out why my injury happened.	.41								
I have been cheated.	.73								
I feel as if I have been cheated by being injured.	.77								
Restlessness		1.21	2	.55	.00	.79	.01	1.0	1.0
I am unable to enjoy myself.	.54								
I am unable to relax.	.68								
I am unusually anxious.	.63								
I feel uneasy.	.47								
Isolation		1.33	2	.51	.00	.77	.01	1.0	1.0
Socially I feel like an outcast.	.77								
Teammates seem to have lost interest in me.	.63								
I feel isolated.	.68								
I don't feel like mixing with other performers.	.53								

Table 4 Fit Statistics for Two-Factor Models and Full Models

Factor / Items	χ^2	<i>df</i>	$p(\chi^2)$	RMSEA	RMSEA <i>p</i> value	SRMR	CFI	GFI
Devastation and dispirited	98.00	19	.00	.11	.00	.06	.92	.94
Devastation and reorganization	23.70	13	.03	.04	.59	.03	.98	.98
Devastation and feeling cheated	50.63	19	.00	.07	.10	.04	.97	.97
Devastation and restlessness	53.97	19	.00	.07	.07	.04	.95	.97
Dispirited and reorganization	43.13	13	.00	.08	.03	.05	.94	.97
Dispirited and feeling cheated	80.62	19	.00	.09	.00	.05	.93	.96
Dispirited and restlessness	119.62	19	.00	.11	.00	.06	.89	.93
Reorganization and feeling cheated	18.40	13	.14	.03	.82	.03	.99	.99
Reorganization and restlessness	33.10	13	.00	.06	.21	.05	.95	.98
Feeling cheated and restlessness	53.45	19	.00	.06	.16	.04	.96	.97
Isolation and restlessness	62.87	19	.00	.08	.01	.05	.94	.96
Isolation and feeling cheated	44.76	19	.00	.06	.28	.04	.97	.97
Isolation and dispirited	42.35	19	.00	.05	.35	.04	.97	.98
Isolation and reorganization	10.55	13	.65	.00	.99	.02	1.0	.99
Isolation and devastation	57.74	19	.00	.07	.05	.04	.96	.97
Full six-factor model	502.57	215	.00	.06	.02	.05	.91	.90
Five-Factor model (dispirited removed)	304.10	142	.00	.05	.04	.04	.93	.93

this subscale is consistent with the empirical research that has provided support for Isolation as a characteristic of injured athletes' responses to sport injury.^{12,40,41} The process of scale refinement and the emergence of Isolation also served to clarify the meaning of the Restlessness and Dispirited subscales. The changes to the items from the original subscales (to facilitate the emergence of Isolation) reinforced the subscale meaning. Specifically, the removal of "I don't like mixing with other performers" and the inclusion of "I feel restless" provided support for the original subscale label (Restlessness) and resulted in improved factor loadings and generally better fit statistics across all the analyses involving this subscale. The same was not true of the fit statistics for the subscale Dispirited, although the factor loadings did provide support for greater construct validity with the inclusion of the items "I feel dispirited" and "I get depressed about being injured" (see Table 4).

In relation to the subscale Feeling Cheated, the fit statistics were adequate when the original items were retained; however, when "I can't help but feel bitter" was replaced by "I experience feelings of jealousy," the fit statistics across all the analyses that included this subscale were slightly improved. The inclusion of this latter item was once again felt to offer improved construct validity, with much improved factor loadings; this item was therefore retained in the revised model. As a response to injury research has provided support for athletes' perceptions of feeling cheated (eg,¹²). In the case of the analyses of the subscale Reorganization, as previously discussed, the only item that had a social context loaded on to Isolation. This item was one of two items in the previous analyses that had a relatively low factor loading. The other item that had had a low factor-loading ("I suffer from increased tension") cross loaded on to a number of the subscales in the present study. This is perhaps not surprising given that the item reflected "increased tension," a response that may be associated with heightened levels of a number of psychological response variables (eg, Restlessness and Feeling Cheated). Indeed, the removal of these two items and the inclusion of one new item ("I am feeling mentally stronger") resulted in improved factor loadings and improved fit statistics across all analyses. In addition, the changes to the subscale did not detract from the meaning attached to it. In contrast to the previous study, fit statistics for all models that included Reorganization were very good. Whether this finding reflects sampling procedures and increased sample size, model refinement, or a reduction of the number of items from four to three is unclear. What is clear, however, is that Reorganization and the increased confidence implicit within this subscale is consistent with research that has explored athletes' responses across the whole period of rehabilitation.^{25,42}

The subscale Devastation was the only subscale where all of the original items were retained. The results of the single factor analysis showed improved factor loadings for all of the items despite poorer single factor fit statistics. Generally, however, and consistent with the findings of the full model, pairwise fit statistics for this subscale were overall much better than in the previous study. Once again, and consistent with the empirical research, the results provided support for the construct validity of Devastation. Indeed, this subscale continued to reflect an intensity that has been reported to be associated with the loss of important attachments that may occur as a result of athletes' sustaining sports injuries.⁸

Summary and Conclusions

The present paper reports two studies conducted to advance the development of a population specific measure to assess the psychological responses of injured athletes. The results of the confirmatory factor analysis provided some support for the factorial and construct validity of the PRSII. The PRSII comprises a number of response characteristics that have not been accounted for in the measures that have been utilized in injury research to date. However, the responses are consistent with empirical research.^{12,26,42} The assessment of such response characteristics is essential if researchers and applied practitioners are to accurately assess injured athletes' psychological responses to injury and design interventions that are theoretically underpinned to expedite athletes' successful return to competitive sport. The Appendix contains the 19-item PRSII derived from the present research.

A number of researchers have called for the development of process-oriented measures that address intraindividual changes, as well as being capable of inter-individual comparisons.^{21,22} This is an important feature of the research reported here. The approach adopted for the development of the PRSII also addresses the need for researchers to devise measures that can be used to explore the transient nature of athletes' responses.^{2,8,9,40} The findings of such research should enhance the effectiveness of the design and implementation of psychological interventions.

In relation to the continued development of the PRSII, research should examine, where possible, the concurrent and divergent validity of the 6-subscale measure, as well as its predictive validity. This would not only add to the evidence reported here for the construct validity of the PRSII, but enable an assessment of the potential use of the measure to predict recovery related outcomes (eg, rehabilitation adherence, confidence restoration). Researchers are encouraged to utilize the measure across a range of injured population groups at different points of the rehabilitation period. This type of research would benefit from adopting interindividual and intraindividual approaches.

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Appendix

Psychological Response to Sport Injury Inventory (PRSII 19-item version)

This inventory contains a number of statements about the experience of injury. Read each statement and indicate by circling the relevant point on the scale, the extent to which the statement reflects how you presently feel. If you strongly agree, circle 1; if you strongly disagree, circle 5 – and points between as to extent of your feelings. Please make sure that you answer all questions and that you only circle one number per question. Do not place a circle between any two numbers. There are no right or wrong answers, so please answer honestly. The information will be treated in strictest confidence.

	Strongly Disagree			Strongly Agree	
1. I am unable to enjoy myself.	1	2	3	4	5
2. I experience feelings of jealousy	1	2	3	4	5
3. I have difficulty accepting that I am injured.	1	2	3	4	5
4. Team-mates seem to have lost interest in me.	1	2	3	4	5
5. I am feeling mentally stronger.	1	2	3	4	5
6. I feel isolated.	1	2	3	4	5
7. I am devastated by the injury.	1	2	3	4	5
8. I am unable to relax.	1	2	3	4	5
9. I am unusually anxious.	1	2	3	4	5
10. I cannot work out why my injury happened.	1	2	3	4	5
11. My world has fallen apart.	1	2	3	4	5
12. Socially I feel like an outcast.	1	2	3	4	5
13. I have been cheated.	1	2	3	4	5
14. I am beginning to feel like myself again.	1	2	3	4	5
15. I feel uneasy.	1	2	3	4	5
16. I have much more confidence in myself.	1	2	3	4	5
17. I experience a feeling of emptiness.	1	2	3	4	5
18. I don't feel like mixing with other performers.	1	2	3	4	5
19. I feel as if I have been cheated by being injured.	1	2	3	4	5

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