



Development and Validation of Sport Confidence Questionnaire of Rehabilitated Athletes Returning to Competition

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Abstract

Objectives: To develop a questionnaire to assess athletes' confidence returning to competition following a musculoskeletal injury namely "Sport Confidence Questionnaire of Rehabilitated Athletes Returning to Competition" (SCQ-RARC). Design: Validity and reliability study.

Method: The total sample used for examining the validity and reliability of the instrument was 406 participants. In particular, the content validity and factorial structure of the SCQ-RARC was tested using a sample of 36 judges and 186 rehabilitated athletes, respectively.

Results: The results of exploratory factor analysis revealed a 14-item model which examined "Confidence due to rehabilitation" and "General confidence". Confirmatory factor analysis with a new data sample (N=184) yielded adequate indices of fit only for the proposed two first-order factors of the SCQ-RARC. Moreover, convergent and discriminant validity for the new instrument was tested by examining relations with other constructs. Finally, the two factors of the instrument have good internal consistency and test-retest reliability.

Conclusion: The SCQ-RARC is a valid and reliable instrument that can be used for clinical and research purposes.

Keywords: Confidence; Questionnaire; Validity; Reliability; Sport injury

Introduction

Sport injury is an unfortunate physical event, which may cause loss of hours of training and participation to competitions, thus probably a decrease in performance. In addition to the physical consequences of an injury, athletes struggle psychologically; thus rehabilitation from sport injury involves not only physical, but also psychological considerations [1]. An important component related to psychological recovery of athletic injury is self-confidence [2]. Self-confidence has been defined as the belief or degree of certainty that an individual possesses about his/her ability to be successful in sport [3]. In particular, it influences various aspects of rehabilitation from initiation to conclusion (e.g., program confidence, adherence confidence, physical confidence, return to sport confidence) [4]. Returning to sport and/or competition following an injury, athletes may experience decreased performance and low level of self-confidence [5]. Attaining previous physical performance was suggested to be one of the primary significances for athletes who 5 reentry to sport competition [6,7]. It is crucial for them to regain high confidence levels regarding their physical competence [8]. Therefore, during the recovery process, athletes should correctly follow and complete an appropriate rehabilitation program to perform up to pre-injury level in the upcoming competition.

Gaining confidence in the injured body part is essential for the re-entry success into competition [9]. Therefore the sports medicine/injury rehabilitation personnel should increase athletes' confidence about successfully completing the rehabilitation program. Designing a rehabilitation program for each athlete depending on their individual characteristics enhances their adherence. Moreover, the sports medicine/injury rehabilitation personnel should apply practical strategies to enhance injured athletes' adherence behavior (e.g., social support and thought stoppage) [10]. Furthermore athletes' relationship with sports medicine/injury rehabilitation personnel can influence their motivation to complete the rehabilitation program, thus their degree of certainty to achieve performance goals. Setting specific and realistic achievable goals, during recovery and re-entry period, can operate as

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a mechanism to create positive expectations and beliefs about goal attainment, thereby enhance confidence to obtain best performance following an injury [7,11]. Due to the significance of the role of confidence for athletes' re-entry to sport competition following an injury, the aim of the present study was to describe the development and validation of the Sport Confidence Questionnaire of Rehabilitated Athletes Returning to Competition (SCQ-RARC). In the frame of this questionnaire, two factors were taken into consideration: "Confident due to Rehabilitation" and "General Confidence". The existing sport confidence measures such as "Trait-State Sport Confidence Inventory"³ have not been developed to assess rehabilitated athletes' confidence. Better measures are needed to examine injured athletes' confidence when they return to sport training and competition [12]. In addition, the "Injury-Psychological Readiness to Return to Sport Scale" (I-PRRS) is an instrument which examines athlete's psychological readiness to return to sport after an injury, but it hasn't been fully examined psychometrically yet [13].

As a result, having a questionnaire to objectively assess rehabilitated athletes' perceptions of confidence on returning to competition, can enable the sports medicine/injury rehabilitation personnel (i.e., physiotherapist and coach) to assist athletes in increasing confidence for effectively performing sport skills.

Methods

The initial item pool of the SCQ-RARC was derived from: (a) the existing literature/theory, (b) the content and the phraseology of the current existing questionnaires that examine confidence on sport, and (c) three open-ended questions to athletes from team sports, who had a musculoskeletal sport injury in the last six months, completed the physiotherapy program, and were ready to re-entry to competition. Generally, the athletes answered that restoring sport-confidence beliefs about their capabilities to achieve pre-injury fitness levels is fundamental to perform successfully prior to competition. They also reported that the recovery process contributes in their feeling certain to achieve optimal sport performance returning to full competitive involvement. The initial form of the SCQ-RARC consisted of 32 items.

Thirty-six judges (10 physiotherapists, 10 psychologists, 11 teachers of the Department of Physical Education and Sport Science, and 5 Master of Science students of sport psychology) examined the content validity of this initial version of the SCQ-RARC. The judges were asked to familiarize themselves with the two conceptual factors: "Confident due to Rehabilitation" and "General Confidence". Specifically, it was made clear that the first factor contains items that describe athletes' confidence due to the process of rehabilitation phase (e.g., adherence and successful completion of the rehabilitation program). The second factor, "General Confidence", contains items which show the athletes' confidence to perform successfully (i.e., perform as well as required, perform under competition's pressure). Then, the judges were asked to match each of the 32 items to one of the two factors. Additionally, they were asked to rate the degree to which the content of every item matched the content of each of the two factors with a 5-point scale. The judge's written evaluations contained a variety of statistical analyses (e.g., ANOVA tests, post hoc with Bonferroni's correction, Aiken's V content validity coefficient). Four items of the SCQ-RARC were deleted according to judge's written and oral comments on each item [14]. Thus, the new version of the SCQ-RARC consisted of 28 items which describe how confident athletes are, with a seven-point Likert-type format: 1= not at all, 4=

moderate and 7= very much.

The criteria for athletes' inclusion in the present study were: (a) returning to sport competition after a musculoskeletal sport injury in the last year, (b) having a musculoskeletal sport injury with minimum and maximum duration of injury time of 10 days and 10 weeks, respectively, (c) participating and completing the physiotherapy rehabilitation program (the doctor, sport physiotherapist, and coach were responsible for the decision-making process in returning to competition based on their own criteria), (d) having at least three years of competitive experience (non-elite athletes), and (e) being from 18 to 45 years old.

The sample was recruited using an open invitation to coaches, sport clubs, physiotherapists, and injured athletes themselves. All participants of the present study were required to complete a written informed consent form. All procedures were approved by the Institutional Research Ethics Board for Human Investigation. For Exploratory Factor Analysis (EFA), participants were initially 216 volunteered athletes from a team sport, judo, kickboxing, and tae-kwon-do. However, 186 athletes (107 men, 79 women) (86% of the total sample) provided complete data on the SCQ-RARC responses. One hundred eighty four volunteer athletes (138 men and 46 women) from four team sports (soccer, basketball, water-polo, and handball) were recruited for the Confirmatory Factor Analyses (CFA) procedure. The participants' response rate was 80% (initial sample of 230 athletes). All the participants had a musculoskeletal injury in different parts of the body in the previous year. They completed a physiotherapy program and were considered ready for re-entry into competition. They were asked to complete the demographic questionnaire and the SCQ-RARC in the beginning of the first sport competition. The completion of these forms took approximately 20 min.

Maximum Likelihood (ML) with promax rotation was used in the EFA to determine if the SCQ-RARC represented the two-hypothesized factors by using the Statistical Package for Social Science (SPSS; Version 12.0) [15,16].

Specific criteria were considered in determining the number of factors that rotate and in accepting the factor structure of the instrument [16,17].

The internal consistency of the SCQ-RARC was examined by calculating items' mean and variance, inter-item correlations, item-total correlations, and Cronbach's a coefficient. The Cronbach's a coefficient should exceed the value of 0.70. Intraclass correlation coefficients (ICC) of the two subscales of the SCQ-RARC were also assessed within a one-week interval [18].

CFA is a structural equation modeling technique that assumes multivariate normality. Therefore the initial analysis examined the multivariate normality of the SCQ-RARC items using Maximum Likelihood estimation (ML) method and employing an EQS 5.7b [19,20]. As recommended, several indices were employed to assess the model fit, i.e., χ^2 , the Satorra-Bentler χ^2/df ratio, the SRMR, the RMSEA, the 90% CI of the RMSEA, the NNFI, the CFI, the PNFI and the average off-diagonal standardized residual [21]. Furthermore, the values of factor loadings of the items above 0.40 were considered indicative of an acceptable model fit. Coefficient a, item means and variances, inter-item correlations, item-total correlations, and ICCs with a one week interval were again examined for the SCQ-RARC.

Table 1: Exploratory factor analysis: Factor loadings, communalities, eigenvalues and percentage of explained variance of the Sport Confidence Questionnaire of Rehabilitated Athletes Returning to Competition (N=186).

Sport Confidence Questionnaire of Rehabilitated Athletes Returning to Competition items	Factor loadings		Communalities
	Factor 1	Factor 2	
Item 8	0.98	0.02	0.94
Item 9	0.98	0.02	0.93
Item 13	0.94	0.01	0.87
Item 2	0.93	0.05	0.82
Item 12	0.92	0.07	0.92
Item 4	0.91	0.07	0.9
Item 6	0.91	0.01	0.83
Item 10	0.88	0.01	0.78
Item 7	0.1	0.88	0.69
Item 11	0.02	0.87	0.73
Item 1	0.07	0.84	0.64
Item 3	0.04	0.82	0.71
Item 14	0.08	0.76	0.65
Item 5	0.14	0.7	0.6
Eigenvalues	8.35	2.71	
% explained variance	59.61	19.34	

The convergent validity of the SCQ-RARC was examined by using the vigor subscale (6 items) of the Profile of Mood States (POMS) (unpublished data), the self-confidence subscale (5 items) of the Competitive State Anxiety Inventory-II (CSAI-II) (unpublished data), and the State Sport Confidence Inventory (SSCI) (13 items) (unpublished data) [6,22,23]. The reason for using the vigor subscale of POMS was that confidence enhances the degree of trying to succeed, thus the individual usually has feelings of excitement, alertness, and physical energy until he/she succeeds the goal [24]. The reason for using CSAI-II and SSCI is that confidence consists the central concept for both instruments. Discriminant validity was tested using the confusion and tension subscales (5 and 6 items, respectively) of the Profile of Mood States (POMS) (unpublished data) [22]. The reason for using the POMS measure to test discriminant validity is that confusion and tension are totally different constructs.

Results

The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.95 and the Bartlett's test of sphericity was significant (7278.49, df=378; $p < 0.00001$) indicating that the matrix was suitable for factor analysis [17]. The values of skewness and kurtosis were lower than the cut-off criteria. The results yielded a two-factor solution with eigenvalues of 16.08 and 4.49 for the 1st and the 2nd factor respectively, which accounted for 73.49% of the total variance. The communalities ranged from 0.31 to 0.93. The factor loadings of the pattern matrix ranged from 0.48 to 0.98. Inter-factor correlation between the two factors was 0.52.

Due to the existence of cross loadings and the similar wording of the items, 14 items remained in the SCQ-RARC. The skewness and kurtosis values indicated items' normality. Then, they were subject to a second maximum likelihood EFA with a promax rotation of the two factor solution. The second factor analysis yielded again two-factor solution which accounted for 78.95% of the total variance. The two factors were labeled "Confident due to Rehabilitation" (CO-R) and "General Confidence" (G-CO), respectively. The CO-R factor consisted of 8 items, and the G-CO factor consisted of 6 items. The factor loadings of the items were significant and items' communalities ranged from 0.60 to 0.94 (Table 1). Inter-factor correlation between the two factors was 0.50. The Cronbach's α indices were acceptable; in particular for the SCO-R factor the internal consistency index was 0.98 and for the G-SCO factor 0.92. In addition, the inter-item and item-total correlations of the SCQ-RARC showed a good internal consistency of the two subscales. Also, the test-retest reliability of the two subscales of the SCQ-RARC was high. Before conducting CFA, the normality of the items was again examined. The values of skewness and kurtosis of the SCQ-RARC items ranged from -0.55 to -0.16, and from -0.67 to 0.10, respectively. The results of Mardia's coefficient (normalized estimate =17.66) revealed acceptable multivariate kurtosis among the items. This value is smaller than the cut-off point of 240 [14 items of SCQ-RARC X (14 items + 2) = 240]. The results of this analysis revealed that the two first-order factor solution (FM2) displayed a very good fit [χ^2 (df 76) = 122.54; $p < 0.001$]. All the fit indices indicated that the FM2 is the best fitting (Table 2). All factor loadings ranged from 0.70 to 0.89 and were acceptable. The "Confidence due to Rehabilitation" factor (M factor loadings =0.84) and the "General Confidence" factor (M factor loadings =0.75) are

Table 2: Fit Indices of the three measurement models of the Sport Confidence Questionnaire of Rehabilitated Athletes Returning to Competition (N=184).

Models	χ^2/k^d	df ^e	$\Delta\chi^2/f^f$	Δ_{df}^g	χ^2/df	NFI ^h	NNFI ⁱ	CFI ^k	ΔCFI^l	SRMR ^m	RMSEA (90% CI) ⁿ	PNFI ^o
FM ₂ ^a	122.54	76	-	-	1.61	0.938	0.971	0.975	-	0.037	0.058 (0.038 - 0.076)	0.783
FM ₁ ^b	405.56	77	283.014	1	5.27	0.796	0.795	0.827	0.148	0.11	0.153 (0.138 - 0.167)	0.673
HM ₁ ^c	403.4	77	280.853	1	5.24	0.797	0.797	0.827	0.148	0.11	0.153 (0.137 - 0.166)	0.673

^atwo first-order factor model.

^bsingle first-order factor model.

^chierarchical model.

^dchi-square statistic for the hypothesized model.

^edegrees of freedom for the hypothesized model.

^f χ^2 difference.

^gdf difference.

^hnormed fit index.

ⁱnon-normed fit index.

^kcomparative fit index.

^lCFI difference.

^mstandardized root mean squared residual.

ⁿroot mean squared error of approximation (90% confidence interval).

^oparsimonious normed fit index.

Table 3: Internal consistency indices (mean, minimum value, maximum value) for the Sport Confidence Questionnaire of Rehabilitated Athletes Returning to Competition (N=184).

Sport Confidence Questionnaire of Rehabilitated Athletes Returning to Competition	Item	Item	Inter-item	Item-total	Cronbach
	means	variances	correlations	correlations	<i>a</i>
	(Min ^a -Max ^b)				
Confident due to Rehabilitation	4.95 (4.82 - 5.01)	2.05 (1.77-2.23)	0.70 (0.58 - 0.81)	0.81 (0.75 - 0.87)	0.95
General Confidence	5.13 (4.97 - 5.42)	1.68 (1.26-1.97)	0.57 (0.48 - 0.66)	0.70 (0.66 - 0.75)	0.89

^aMinimum.

^bMaximum.

consisted of eight and six items, respectively. Lastly, inter-factor correlation between the two factors was 0.65 (p<0.05), indicating that there is a moderate similarity between constructs. Finally, a single Factor Model (FM1) and a Hierarchical Model (HM1) were also examined and did not show adequate model fit. The fit indices of the three measurement models are presented in Table 2.

A sample of 184 athletes was used to examine the concurrent and discriminant validity of the SCQ-RARC. The CO-R and G-Co factors of the SCQ-RARC had significant correlations with the vigor, self-confidence and self-confidence subscales. No significant correlations were found between the SCQ-RARC and the tension and confusion subscales of the POMS.

Regarding the internal consistency and test-retest reliability of the new measurement, the two subscales are appeared internally consistent. The inter-item correlations, the item-total correlations, and the internal consistency coefficients of the subscales are summarized in Table 3.

Discussion

The aim of the present study was to develop a self-reported questionnaire to measure athletes' confidence levels on returning to competition after an injury. Statistical analyses yielded a two-factor solution, namely "Confident due to Rehabilitation" (CO-R) and "General Confidence" (G-Co).

Sport injury may cause loss of confidence upon returning to competition [2]. When rehabilitated athletes return to training and competition after an injury, they tend to have concerns about: (a) performing up to pre-injury levels, (b) not having social contact with teammates and training partners, and worries about re-injury [25,26]. Athletes may rely on rehabilitation progress and performance to ascertain their readiness to return to sport following the completion of the rehabilitation program [27]. Athletes who comply with the rehabilitation program, they may perform the rehabilitation exercises correctly and may complete successfully the recovery process, which leads to a healed injury. As rehabilitated athletes become more prepared to play again, their confidence level increased. The first factor's items contain statements such as "I am confident that I can compete since I completed all phases of the rehabilitation program" and "I am confident that I can compete because I consistently adhere to the rehabilitation program". Therefore, they would be physiologically and probably psychologically ready to return to competition. However, athletes who are not psychologically prepared to return to competition, they may become pre-occupied about the healing process of the injured area and about their physical condition which can decrease their self-confidence. As a result, athletes who have premature return to competition may have lower confidence levels [7,28].

Performance accomplishments are expected to be the most

instrumental with regard to future confidence beliefs [12]. Performing well in training and in competition and seeing improvements in performance may enhance athletes' confidence in their ability to achieve pre-injury standards and reach performance goals. The second factor was consisted of statements regarding general confidence such as "I am confident that I can perform as well as required" and "I am confident that I can compete according to my capabilities". Setting performance goals has been shown to enhance athletes' confidence in their ability to achieve their full post-injury potential [7,9,11]. The sports medicine/injury rehabilitation personnel should encourage athletes to set specific short-term and/or long-term goals for future sport activity.

Using the SCQ-RARC, researchers can measure rehabilitated athletes' confidence objectively before re-entering the sport competition. This questionnaire can be used to athletes after following a specific physiotherapy rehabilitation program and were ready to return from a mediate and/or a long term injury. This instrument may inform the sports medicine/injury rehabilitation personnel (i.e., physiotherapist, coach, and psychologist) whether or not athletes' confidence is adequate to face the upcoming competition challenges. Rehabilitated athletes who have low self confidence levels due to recovery process (adherence problems or incorrect manner of performing exercises) they may perform strength, endurance, or neuromuscular exercises before re-entering into competition. The athletes who will not return to their previous level of activity, they may be less confident to achieve performance goals than those who will return to their previous level of activity. Thus, it is important for athletes returning to sport after an injury to feel competent to play at a high level. Athletes should follow a further psychological intervention to build confidence prior to competition, thus enabling them to make a safe and successful return to competition. The SCQ-RARC can also be applied to examine the efficacy of a psychological intervention program used to enhance athletic performance after an acute sport injury. Furthermore, athletes themselves can use this instrument to objectively examine their confidence levels. Finally, the SCQ-RARC has few items, thus it takes little time to complete.

There were some limitations to in the present study. First, the data were collected from athletes who participated in team sports. To increase the generalizability of the SCQ-RARC it would be advisable to assess the factor structure of the SCQ-RARC with groups from individual sports. Second, the SCQ-RARC may not be used during the rehabilitation program and/or the training phase of rehabilitated athletes. It has been developed to be completed by the rehabilitated athletes before their first sport competition.

Future research could address to the relationship between the scores of SCQ-RARC and other theoretical constructs, such as worry, attention, and intrinsic motivation. Researchers can correlate and/or compare athletes' confidence with physical characteristics

(e.g., strength, endurance, balance, proprioception, etc.). Future investigations could also examine the measurement invariance of the SCQ-RARC across various subgroups of interest. It would be beneficial to determine if the factor structure of the new instrument remains consistent between genders, across racial/ethnic groups, and across age groups.

Conclusion

The Sport Confidence Questionnaire of Rehabilitated Athletes Returning to Competition (SCQ-RARC) is a psychometric instrument that examines sport confidence returning to competition following an injury. It consists of 14 items, which represent two factors, namely "Confidence due to rehabilitation" and "General confidence". It can be used both for clinical and research purposes. Future studies should develop a questionnaire that assesses correlation between rehabilitated athletes' confidence and other theoretical constructs, such as worry and attention.

Practical Implications

- The SCQ-RARC is a valid, reliable and short instrument examining athletes' self confidence returning to competition following an injury.

- Athletes can use the SCQ-RARC to objectively examine their confidence levels.

- The SCQ-RARC can be applied to examine the efficacy of a psychological intervention program used to enhance athletic performance following an acute injury.

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