

# The Shoulder Instability-Return to Sport after Injury (SIRSI): a valid and reproducible scale to quantify psychological readiness to return to sport after traumatic shoulder instability

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## Abstract

**Purpose** The main goal of this study was to propose and validate a tool to quantify the psychological readiness of athletes to return to sport following traumatic shoulder instability and conservative or surgical management.

**Methods** «Knee» was replaced by the term «shoulder» in the Anterior Cruciate Ligament-Return to Sport after Injury scale. This pilot test of the Shoulder Instability-Return to Sport after Injury scale (SIRSI) was performed in a group of athletes who underwent surgery for post-traumatic chronic anterior shoulder instability. The final version was then validated according to the international COSMIN methodology. A retrospective study was performed including all rugby players who had reported an episode of instability between 2012 and 2013. The WOSI and the Walch-Duplay scales were used as reference questionnaires.

**Results** Sixty-two patients were included, mean age  $26 \pm 5.2$  years old, 5 women/57 men. Patients were professional or competitive athletes (70.9%) and followed-up for  $4.6 \pm 1.6$  years after the first episode of shoulder instability. Shoulder surgery was performed in 30/62 (48.4%) patients, a mean  $1.6 \pm 1.2$  years after the first episode of instability. The SIRSI was strongly correlated with the reference questionnaires ( $r = 0.80$ ,  $p < 10^{-5}$ ). The mean SIRSI score was significantly higher in patients who returned to play rugby ( $60.9 \pm 26.6\%$  vs  $38.1 \pm 25.6\%$ ,  $p = 0.001$ ). The internal consistency of the scale was high ( $\alpha = 0.96$ ).

Reproducibility of the test–retest was excellent ( $\rho = 0.93$ , 95% CI [0.89–0.96],  $p < 10^{-5}$ ). No ceiling/floor effects were found.

**Conclusion** The SIRSI is a valid, reproducible scale that identifies patients who are ready to return to the same sport after an episode of shoulder instability, whether they undergo surgery or not.

**Level of evidence** III.

**Keywords** Shoulder · Instability · Dislocation · Subluxation · Return to sport · Psychological readiness

## Introduction

The incidence of shoulder instability is twice as high in athletes as in the general population [24]. In the literature the functional results of both arthroscopic and open surgical treatment to stabilize the shoulder are good [15], but the rate of return to sport at the same level of play varies between 48% [8] and 95.7% [13].

After a severe injury the emotional and behavioural reactions of athletes evolve along with the three stages of healing [17]. Clement et al. [6] confirmed these stages in a qualitative study with a semi-structured interview. During the acute post-traumatic period, athletes express negative emotions that are directly linked to their evaluation of the severity of their injury and the supposed amount of time that they must refrain from playing sports. During physical rehabilitation, these reactions are more ambivalent, and frustration is the main emotion. When they return to play, athletes think about the lessons they have learned from the injury and express doubts about their ability to return to play, anxiety and fear of a new injury. During these three stages, the athletes emphasize their need for support from

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those around them. According to Taylor and Taylor [20], return to sport also follows five successive stages from the initial return to return to competitive play. The psychological state of the athlete also plays a central role in this process.

All of these studies show that after a serious injury an athlete must be psychologically and physically ready to begin playing the same sport again. However, psychological factors cannot be evaluated by traditional tools. Webster et al. [27] developed a questionnaire, the Anterior Cruciate Ligament-Return to Sport after Injury (ACL-RSI) to quantify the psychological readiness of athletes to return to sport following surgical ACL reconstruction. The main goal of the present study was to propose a similar tool for shoulder instability, whatever the type of conservative or surgical management. Our hypothesis was that this tool would be reproducible and valid to assess the psychological readiness of athletes to return to the same sport after an episode of shoulder instability. A validated and specific questionnaire could be useful for physicians to avoid the return to sport in patients who are not ready for psychological reasons.

## Materials and methods

### Proposed Shoulder Instability-Return to Sport after Injury (SIRSI) scale

Based on the validated ACL-RSI [5] scale, the term «knee» was replaced by the term «shoulder». The question 4 “Are you confident that your knee will not give way by playing your sport?” was replaced by “Are you confident that your shoulder will be stable during playing your sport?” According to international guidelines for self-administered questionnaires [3], a pretest of this first version was administered to randomly chosen athletes who underwent surgery between 2013 and 2014 for post-traumatic chronic anterior instability of the shoulder. This version was then adapted to the remarks of the test population, in particular their general impression and the specific words chosen. The questionnaire was filled out at least 6 months after surgery.

### Validity and reproducibility of SIRSI

The final version (Figs. 1, 2) was validated according to international CONsensus-based Standards for the selection of health status Measurement Instruments (COSMIN) [16] guidelines.

This retrospective study included a series of patients who were rugby players of all age groups and categories throughout France with a licence at the Rugby Federation. These patients had filed an insurance claim to the Rugby

Federation for an episode of shoulder instability (dislocation or subluxation) that had occurred while playing rugby in a match or at a training session during the 2012–2013 rugby season. Exclusion criteria were patient refusal and follow-up of less than 2 years.

The scales used as reference questionnaires were the validated versions of the Western Ontario Shoulder Instability Index (WOSI) [12, 14] and the Walch-Duplay [23] score.

After at least 2 years of follow-up each patient was first contacted by telephone to explain the study and obtain his/her consent. An email was then sent containing the written consent form, and a link to an electronic version of the reference questionnaires. The online questionnaire was constructed and administered using WebSurvey<sup>®</sup> software. In the absence of a response, a second email was sent, and if necessary, participants were contacted by telephone. The SIRSI was completed by patients twice at 15-day intervals. The questionnaires could only be validated if all of the questions were answered.

### SIRSI

The original version of the ACL-RSI was based on three components that have been correlated to return to sport in the literature: emotions, confidence in one’s performance and evaluation of risk [27]. Like the ACL-RSI, the SIRSI includes 12 questions with an 11-point Likert scale in the form of blocks to be ticked from 0 to 10. The total score is equal to the sum of the values of the 12 responses then determined in relation to 100 to obtain a percentage. High scores correspond to a positive psychological response.

This study was approved by an Institutional Review Board (*CPP IDF VI, Hôpital La Pitié Salpêtrière*). Informed consent was obtained from each patient.

### Statistical analyses

The number of included patients was determined empirically by a random sampling of 20% of the patients who fulfilled the study criteria [4]. The WOSI score was between 0 (excellent) and 2100 (very poor). The Walch-Duplay score was graded on the basis of 75 points because patients had not been seen at follow-up and «range of motion» had not been evaluated. Only the subitems «daily activities», «stability» and «pain» were recorded on the Walch-Duplay scale. Construct validity was tested between the SIRSI, the total WOSI and its different subitems and the Walch-Duplay score by the Pearson’s  $r$  coefficient. The correlation was considered to be «strong» ( $r > 0.5$ ), «moderate» ( $0.5 < r < 0.3$ ) or «weak» ( $0.3 < r < 0.1$ ) [7]. Discriminant validity was tested between the group of patients «that had returned to play a rugby match» and the group «that had not returned

## Echelle SIRSI

### **Instructions:**

**Merci de répondre aux questions suivantes concernant le sport principal que vous pratiquiez avant l'accident. Pour chaque question, cochez la case entre les deux extrêmes selon ce qui vous paraît correspondre le mieux à votre situation actuelle.**

### **1. Pensez-vous pouvoir pratiquer votre sport au même niveau qu'auparavant?**

Pas du tout sûr	0	1	2	3	4	5	6	7	8	9	10	Totalement sûr
	<input type="checkbox"/>											

### **2. Pensez-vous que vous pourriez vous blesser de nouveau l'épaule si vous repreniez le sport?**

Extrêmement probable	0	1	2	3	4	5	6	7	8	9	10	Pas du tout probable
	<input type="checkbox"/>											

### **3. Êtes-vous inquiet à l'idée de reprendre votre sport?**

Extrêmement inquiet	0	1	2	3	4	5	6	7	8	9	10	Pas du tout inquiet
	<input type="checkbox"/>											

### **4. Pensez-vous que votre épaule sera stable lors de votre pratique sportive ?**

Pas du tout sûr	0	1	2	3	4	5	6	7	8	9	10	Totalement sûr
	<input type="checkbox"/>											

### **5. Pensez-vous pouvoir pratiquer votre sport sans vous soucier de votre épaule ?**

Pas du tout sûr	0	1	2	3	4	5	6	7	8	9	10	Totalement sûr
	<input type="checkbox"/>											

### **6. Êtes-vous frustré de devoir tenir compte de votre épaule lors de votre pratique sportive ?**

Extrêmement frustré	0	1	2	3	4	5	6	7	8	9	10	Pas du tout frustré
	<input type="checkbox"/>											

**Fig. 1** SIRSI scale in French

**7. Craignez-vous de vous blesser de nouveau l'épaule lors de votre pratique sportive ?**

Crainte extrême	0	1	2	3	4	5	6	7	8	9	10	Aucune crainte
	<input type="checkbox"/>											

**8. Pensez-vous que votre épaule peut résister aux contraintes ?**

Pas du tout sûr	0	1	2	3	4	5	6	7	8	9	10	Totalement sûr
	<input type="checkbox"/>											

**9. Avez-vous peur de vous reblesser accidentellement l'épaule lors de votre pratique sportive ?**

Très peur	0	1	2	3	4	5	6	7	8	9	10	Pas du tout peur
	<input type="checkbox"/>											

**10. Est-ce que l'idée de devoir éventuellement vous faire réopérer ou rééduquer vous empêche de pratiquer votre sport ?**

Tout le temps	0	1	2	3	4	5	6	7	8	9	10	A aucun moment
	<input type="checkbox"/>											

**11. Etes-vous confiant en votre capacité à bien pratiquer votre sport ?**

Pas du tout confiant	0	1	2	3	4	5	6	7	8	9	10	Totalement confiant
	<input type="checkbox"/>											

**12. Vous sentez-vous détendu à l'idée de pratiquer votre sport ?**

Pas du tout détendu	0	1	2	3	4	5	6	7	8	9	10	Totalement détendu
	<input type="checkbox"/>											

**Score SIRSI (Total x 100) / 120 = \_\_\_\_\_ %**

**Fig. 1** (continued)

to play a rugby match» by the Mann and Whitney test. Internal consistency was estimated by the Cronbach alpha coefficient. Correlation among the items of the questionnaire was considered to be «excellent» if  $\alpha \geq 0.90$  [9].

Reliability was evaluated on a test–retest by the Pearson correlation coefficient and the  $\rho$  intraclass correlation coefficient (ICCC). Reproducibility was considered to be «excellent» ( $\rho > 0.75$ ), «good» ( $0.75 < \rho < 0.40$ ) or

## SIRSI scale

### **Instructions:**

Please answer the following questions referring to your **main** sport prior to injury. For each question tick a box  between the two descriptions to indicate how you are feeling right now relative to the two extremes.

**1. Are you confident that you can perform at your previous level of sport participation?**

Not at all confident	0	1	2	3	4	5	6	7	8	9	10	Fully confident
	<input type="checkbox"/>											

**2. Do you think you are likely to re-injure your shoulder by participating in your sport?**

Extremely likely	0	1	2	3	4	5	6	7	8	9	10	Not likely at all
	<input type="checkbox"/>											

**3. Are you nervous about playing your sport?**

Extremely nervous	0	1	2	3	4	5	6	7	8	9	10	Not nervous at all
	<input type="checkbox"/>											

**4. Are you confident that your shoulder will be stable during playing your sport?**

Not at all confident	0	1	2	3	4	5	6	7	8	9	10	Fully confident
	<input type="checkbox"/>											

**5. Are you confident that you could play your sport without concern for your shoulder?**

Not at all confident	0	1	2	3	4	5	6	7	8	9	10	Fully confident
	<input type="checkbox"/>											

**6. Do you find it frustrating to have to consider your shoulder with respect to your sport?**

Extremely frustrating	0	1	2	3	4	5	6	7	8	9	10	Not at all frustrating
	<input type="checkbox"/>											

**Fig. 2** SIRSI scale in English

**7. Are you fearful of re-injuring your shoulder by playing your sport?**

Extremely fearful	0	1	2	3	4	5	6	7	8	9	10	No fear at all
	<input type="checkbox"/>											

**8. Are you confident about your shoulder holding up under pressure?**

Not at all confident	0	1	2	3	4	5	6	7	8	9	10	Fully confident
	<input type="checkbox"/>											

**9. Are you afraid of accidentally injuring your shoulder by playing your sport?**

Extremely afraid	0	1	2	3	4	5	6	7	8	9	10	Not at all afraid
	<input type="checkbox"/>											

**10. Do thoughts of having to go through surgery and rehabilitation again prevent you from playing your sport?**

All of the time	0	1	2	3	4	5	6	7	8	9	10	None of the time
	<input type="checkbox"/>											

**11. Are you confident about your ability to perform well at your sport?**

Not at all confident	0	1	2	3	4	5	6	7	8	9	10	Fully confident
	<input type="checkbox"/>											

**12. Do you feel relaxed about playing your sport?**

Not at all relaxed	0	1	2	3	4	5	6	7	8	9	10	Fully relaxed
	<input type="checkbox"/>											

$$\text{SIRSI score (Total x 100) / 120} = \underline{\quad\quad} \%$$

**Fig. 2** (continued)

«weak» ( $p < 0.40$ ) [11]. Feasibility was estimated by the percentage of missing responses and the ceiling and floor effects, corresponding to a percentage of patients who attained the minimum score (0) or the maximum score (10) for each question. According to Terwee et al. [21], in

the presence of a ceiling or floor effect of more than 15% there is an inherent problem with the validity of the contents when generating questionnaire items.  $p < 0.05$  was considered to be significant. All analyses were performed with STATA®/IC V 10.0. software.

## Results

### Pretest

The pretest was answered by 14 rugby players, 13 men and 1 woman, mean age  $23.8 \pm 5.6$  years old. The mean follow-up after surgery was  $18.5 \pm 5.2$  months. The group did not have any remarks about the questionnaire and responded to all questions.

### Description of the patients in the validation study

Sixty-two rugby player patients were included, a mean  $4.6 \pm 1.6$  years after the first episode of shoulder instability. The mean age of patients at the first episode of shoulder instability was  $21.3 \pm 5.2$  years old, and  $26 \pm 5.2$  years old when they were evaluated. The series included 5 (8.1%) women and 57 (91.9%) men. The dominant shoulder was involved in 28 (45.2%) of the cases. The level of play at the episode of instability was professional (3.2%), competitive (67.7%), regular recreational (22.6%) or occasional recreational (6.5%). Most patients played rugby union (93.6%), seniors (69.4%). The episode of instability was a dislocation in 45 (72.6%) patients and subluxation in 17 (27.4%). Management of this first episode of instability was surgical in 30 (48.4%) patients.

### Return to sport after at least 2 years of follow-up

Return to a sport such as running or cycling was reported in 55 patients (88.7%) after a median 10 months. Thirty-eight (61.3%) patients returned to playing rugby matches after a median 11.9 months. At the final follow-up, 36 (58.1%) patients were still playing rugby including 29 (46.8%) at level that was identical or better than before injury and 7 (11.3%) at a lower level.

### Construct validity

The SIRSI was strongly ( $r > 0.50$ ) and significantly correlated to all the other scores. This correlation was negative with the total WOSI and its subitems, and positive with the Walch-Duplay (Table 1).

### Discriminant validity

A highly significant difference was found in the SIRSI between the subgroup of 38 patients who returned to playing rugby matches and the 24 who did not:  $60.9 \pm 26.6$  vs  $38.1 \pm 25.6$ , respectively,  $p = 0.001$ .

### Internal consistency

The internal consistency of the scale measuring the strength of the correlation between the 12 items was «excellent» with a Cronbach alpha coefficient of 0.96.

### Reliability

Reproducibility of the scale was analysed by test–retest. The mean SIRSI scores of the first and second tests were  $52.8 \pm 27.7$  and  $52.3 \pm 29.4$ , respectively. The correlation between the two versions was «strong» with a Pearson correlation coefficient of  $r = 0.93$ ,  $p < 0.00001$ . Reproducibility was «excellent» with an intraclass correlation coefficient of  $\rho = 0.93$  [0.89–0.96],  $p < 0.00001$  (Figs. 2, 3).

### Feasibility

None of the answers were missing. The floor and the ceiling effects were 3.2%.

## Discussion

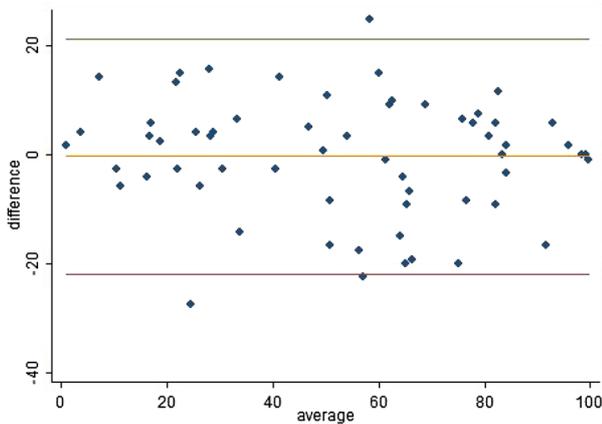
The most important finding of this study was that the SIRSI is a valid and reproducible scale that can identify patients who are psychologically ready to return to the same sport, in this case match rugby, following an episode of shoulder instability that is surgically or conservatively managed. No floor or ceiling effects were found in the questionnaire. The stated hypothesis of the study was confirmed.

The return to sport is becoming the main judgment criteria to define successful conservative and surgical management of patients. Warth et al. [25] showed that the main expectation of 95.5% of patients between 18 and 78 years old who undergo shoulder surgery is to return to

**Table 1** Construct validity of the SIRSI scale and mean values of the different questionnaires of the study at the final follow-up

SIRSI (/100)	WOSI total (/2100)	WOSI (physical symptoms) (/1000)	WOSI (sports/recreation/work) (/400)	WOSI (lifestyle) (/400)	WOSI (emotion) (/300)	Walch-Duplay (75)
$52.1 \pm 28.3$	$657.6 \pm 421.8$	$305.5 \pm 198.1$	$123.1 \pm 94.3$	$89.7 \pm 76.2$	$139.3 \pm 92.4$	$45.8 \pm 11.4$
	$r = -0.80$ $p < 10^{-5}$	$r = -0.71$ $p < 10^{-5}$	$r = -0.81$ $p < 10^{-5}$	$r = -0.75$ $p < 10^{-5}$	$r = -0.70$ $p < 10^{-5}$	$r = +0.70$ $p < 10^{-5}$

*r* Pearson coefficient



**Fig. 3** Reproducibility of the SIRSI scale: Bland and Altman diagram

play. Identifying the risk factors of not returning to sport is therefore a real issue for doctors and surgeons in their daily practice.

Numerous questionnaires have been developed and validated to evaluate functional recovery of the upper limbs, in particular the shoulder. Recently, Roberts and Funk [19] published a questionnaire to evaluate shoulder injuries in rugby players that takes into account the specific physical and technical demands of this sport. However, no questionnaire specifically evaluates the psychological readiness of a patient to return to sport. The systematic review of the literature by Watson et al. [26] shows that consensus criteria for returning to sport after shoulder dislocation are only objective: a painless shoulder, muscular strength comparable to the contralateral side and range of motion considered to be sufficient to practice the patient's usual sport. Nevertheless, a significant difference was found with the patient's psychological condition quantified by the SIRSI. This score was worse in players who had not returned to the same sport after an episode of instability.

In the past few years, several publications have emphasized the influence of psychosocial factors on return to sport. A systematic review by Ardern et al. [1] identified 11 studies evaluating the psychological factors associated with the return to sport. The three main elements of the theory of self-determination [10] including a fundamental need for autonomy, competence and social belonging are associated with the return to sport after injury. Fear is the main negative emotion when returning to play. The psychological factors positively associated with returning to sport are motivation, self-confidence and slight fear. The theory of self-determination is motivational. In athletes with a positive perception of their return to play the intrinsic motivation, which is the interest and satisfaction they obtain from practicing the sport, is significantly stronger than

the external motivation, or the expected benefits of his/her commitment to the sport [18].

The choice of a quantitative questionnaire might seem to be simplistic compared to an open or semi-structured interview. This questionnaire could be useful for doctors and sports surgeons in their daily practice because it provides a standardized, quantified and reproducible analysis of the psychological state of the patient in relation to the return to sport. It makes it possible to follow the patient's progress and to compare results. Tjong et al. [22] obtained interviews of patients operated for shoulder instability 2 years after an arthroscopic Bankart procedure. The results of this qualitative study were similar and confirm that psychosocial factors and not only functional scores must be taken into account in the decision to return to sport.

The need to take into account the patient's psychological readiness when making the decision to return to sport is recent but has been recognized [2]. The SIRSI, like the ACL-RSI, makes it possible to identify patients who will have psychological difficulties returning to play. However, psychological support strategies to help athletes overcome this psychological suffering must be defined.

This study has several limitations. Follow-up was different from one person to another, but was always more than 2 years after treatment, because of the retrospective study design. However, the patient cohort was large, making a random sample possible with a large enough group to validate a self-administered questionnaire. Moreover, the SIRSI was based on an adaptation of the previously validated questionnaire on ACL reconstruction surgery. The original version of the ACL-RSI was based on three components that have been correlated to the return to sport in the literature: emotions, confidence in one's performance and evaluation of risk [27], while still taking into consideration the disease involved.

## Conclusion

The SIRSI is a valid, reproducible scale that identifies patients who are ready to return to the same sport after an episode of shoulder instability, whether it has been treated by surgery or conservative management.

## Compliance with ethical standards

**Conflict of interest** None.

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**Ethical approval** The study was approved by the institutional review board of *Comité de Protection des Personnes Ile de France VI, Hôpital La Pitié Salpêtrière, 75013 Paris, France*.

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