

TRANSLATION AND VALIDATION OF THE DUTCH INJURY PSYCHOLOGICAL READINESS TO RETURN TO SPORT SCALE (I-PRRS)

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ABSTRACT

Background: In facilitating and predicting successful return to sport (RTS), not only are physical factors important, but also the athlete's psychological status. No questionnaire in the Dutch language exists for measuring psychological readiness for RTS after injuries in general.

Purpose: To translate and validate the Injury-Psychological Readiness to Return to Sport scale into the Dutch language.

Study Design: Cross-sectional, validation study.

Methods: One hundred and sixty-eight athletes, returning to high impact sports after lower extremity injuries, completed the Dutch I-PRRS twice. Another 162 athletes who visited their physical therapist for initial intake also completed the questionnaire. Floor and ceiling effects, internal consistency, reproducibility, construct validity, and divergent validity were analyzed.

Results: The I-PRRS was successfully translated into Dutch and showed no floor or ceiling effects. It had good internal consistency (0.85) and good test-retest reproducibility (ICC 0.74, 95% CI 0.43-0.86) where the lower bound of 95% CI indicates at least fair reproducibility. The SEM was 2.02 and the MDC 5.58 points. There was a significant fair correlation between total scores on the I-PRRS and TSK ($r_s = 0.41$, $p < 0.001$). Athletes who RTS and those who initially visited their physical therapist differed significantly on all items and on total scores ($p < 0.001$).

Conclusions: The I-PRRS was successfully translated into Dutch and can be administered to athletes with lower extremity injuries who have clearance to RTS. The MDC of 5.58 on the total score indicated that with a score below six, there is no noticeable change outside the measurement error. For measuring and monitoring psychological readiness for RTS, the use of the Dutch I-PRRS is recommended for Dutch physical therapists.

Level of evidence: 3b

Key Words: Injury Psychological Readiness to Return to Sport scale, lower extremity injuries, psychological readiness, return to sport.

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INTRODUCTION

In the Dutch sporting population, 4.5 million injuries per year occur.¹ More than half of the injuries occur in athletes in high-impact sports,² and in 62% of the cases the lower extremity is affected.¹ Despite the desires of athletes to return to their sport, there is no guarantee for successful return to the same sport level. For instance, after anterior cruciate ligament reconstruction (ACLR), 81-85% of the athletes return to sport (RTS) but only 31-65% return at their desired performance level.³⁻⁵ Also, after hip arthroscopy and partial lateral meniscectomies only 52-61% of athletes are able to return to their pre-injury performance level.^{6,7}

Facilitating successful RTS is a complex process and is influenced by many things such as medical factors, type of sport, physical factors, and internal and external personal factors.⁸ Most studies evaluating RTS have mainly focused on internal factors (e.g. age⁶) or physical recovery.⁹ For example, higher quadriceps strength, higher hamstring strength^{10,11}, and symmetrical hopping performance ($\geq 85\%$)^{4,11,12} favored RTS after ACLR.

The main reasons for not returning to sport or to the desired sports levels after ACLR are self-reported knee problems such as pain, swelling, instability, muscle weakness, fear of reinjury, and lack of confidence.^{3-5,10,13-15} Of those, the most common reason is fear of reinjury and, therefore, not only physical factors are important for RTS, but also the athlete's psychological readiness.^{3,4,15,16} Athletes with a negative perception of the influence of their injury on sport performance were 3.5 times less likely to RTS after ACLR.^{3,16,17} RTS before the athlete is psychologically ready may lead to anxiety, low self-confidence, and lower performance.^{14,15,17} Lower fear of reinjury and greater psychological readiness indeed favored RTS.^{4,10,15,18}

Consequently, measuring psychological readiness for RTS may be important in addition to physical testing. The assessment of confidence in injured athletes using a reliable and valid scale is essential to determine the psychological readiness to RTS.^{16,19} The Injury-Psychological Readiness to Return to Sport scale (I-PRRS) is an easy to use, six-item questionnaire developed by Glazer in the English

language.²⁰ The I-PRRS is a reliable and valid tool to assess the psychological readiness of athletes to RTS investigated in 22 collegiate injured athletes participating in football, basketball, wrestling, ice hockey, lacrosse, and field hockey.²⁰ The I-PRRS was recently translated and validated in the Persian language.¹⁶ However, no Dutch-language version exists. Therefore, the aim of this study was to translate and validate the I-PRRS into the Dutch language and to estimate its internal consistency, reproducibility, and convergent and discriminative validity in athletes returning to high impact sport after lower extremity injuries.

METHODS

The I-PRRS was translated into the Dutch language and was tested for floor or ceiling effects, internal consistency, reproducibility, and validity in 168 Dutch-speaking athletes with lower extremity injury before returning to high impact sports. The Tampa Scale of Kinesiophobia (TSK) was administered to evaluate construct validity. For discriminative validity, 162 athletes with lower extremity injuries who visited their physical therapist for initial intake also completed the I-PRRS and the TSK. These athletes were recruited in the same 29 physical therapy practices. This study was approved by the METC Zuyderland Zuyd, Heerlen, The Netherlands (17-N-44). All athletes gave their informed consent.

Translation procedure

The developer of the original I-PRRS gave his written permission for this Dutch translation. The procedure consisted of forward translation, expert committee review, back translation, pretesting, and finalization.²¹ Two independent translators conducted the forward translation from the original English version into Dutch. Both forward translators were native Dutch speakers, fluent in English; one sports physical therapist working with athletes and one English teacher. An expert review committee, consisting of the two forward translators, the authors (AV, IA, EvT), and two experts, including a sport psychologist and an HR manager, compared the Dutch version with the original one until consensus was reached. Two independent translators performed back translation. These back translators were native English speakers, fluent in Dutch;

one a sports physician and one a sports instructor. After back translation, the two back translators were asked to compare the original English version of the I-PRRS with their own translation. For pretesting, 62 athletes with lower extremity injuries, including ACLR and injuries to the knee, calf, hamstring, ankle, and adductor, completed the pretest version and were invited to make comments. The athletes had received RTS advice based on the individual decision of their physical therapist. This decision was informed by pain, range of motion, sport performance and/or functional tests. After pretesting, the final version of the I-PRRS was investigated.

Participants

A sample of 168 athletes with lower extremity injuries, recruited from 29 physical therapy practices in the Netherlands, completed the Dutch I-PRRS and the TSK²² from May 2017 to October 2017. Athletes were included if they had a lower extremity injury and their physical therapist gave clearance for RTS according to the definition by Ardern 2016¹⁹: "Returning to the defined sport, but not performing at the desired performance level". Athletes were qualified for participation if they met the following criteria: (1) 18-45 years of age, (2) suffering from a lower extremity injury, (3) able to understand the written Dutch language, (4) before the injury occurred practicing a minimum of twice a week of high impact sport with jumping, pivoting, and changes of direction, (5) intention to return to the same sports level as before the injury, and (6) gave informed consent. Athletes were excluded if they had a rheumatic or a neurological disease. The I-PRRS and TSK were administered in a larger study concerning RTS in high impact athletes where besides psychological questionnaires, performance tests were executed.

Procedure

Thirty physical therapists from 29 practices distributed across the Netherlands recruited and examined the athletes in pretesting and final testing of the I-PRRS. Eligible athletes completed the I-PRRS²⁰ and the TSK²² after the physical therapist gave clearance to return to their sport. Questionnaires were completed and collected athletes' characteristics such as gender, age, number of training sessions per week, number of matches per week, time since injury

occurrence, and type of injury. Within one week after completing the I-PRRS, the athletes returning to sport completed the I-PRRS again. RTS was not allowed between the two occasions.

Questionnaires

The I-PRRS measures psychological readiness to RTS and consists of six questions concerning (1) overall confidence to play, (2) confidence to play without pain, (3) confidence to give 100% effort, (4) confidence to not concentrate on the injury, (5) confidence in the injured body part to handle demands of the situation, and (6) confidence in skill level/ability. Each item is scored on a scale ranging from 0-100 with intervals of 10. A score of zero indicates that the athlete has, for instance, no confidence; a score of 50 indicates moderate confidence; and a score of 100 indicates maximum confidence. The scores on the six items are summed and divided by 10. The total score lies between 0 and 60, where 60 indicates maximum confidence.²⁰ Glazer²⁰ described that a score between 50 and 60 suggests that the athlete is psychologically ready to RTS.

The TSK was developed to measure fear of reinjury due to physical activity and was translated into Dutch by Vlaeyen et al.²² The TSK contains 17 questions on a 4-point Likert scale. The sum of the items results in a total score between 17 and 68, where 68 indicates a high level of fear and 17 a low level of fear.²² The Dutch TSK shows moderate reproducibility (ICC 0.75-0.90).^{22,23}

Statistical analysis

Descriptive statistics were calculated to summarize athletes' characteristics and outcomes on the I-PRRS. Percentages of athletes who scored zero or maximum were calculated in order to investigate floor and ceiling effects, respectively. If more than 15% of the athletes achieved the lowest or highest possible score, floor or ceiling effects were considered to be present.²⁴ Internal consistency was calculated using Cronbach's alpha. Internal consistency was considered good if Cronbach's alpha lies between 0.70 and 0.90.²⁵ Test-retest reproducibility was measured using the first and second administrations by calculating Intraclass Correlation Coefficient (ICC_a) (two-way random effects model, single measure)

with their 95% confidence interval (CI). ICC above 0.75 represents excellent reproducibility; 0.60-0.74 good reproducibility; 0.40-0.59 fair reproducibility; and <0.40 low reproducibility.²⁶ The Standard Error of Measurement (SEM) was calculated by multiplying the standard deviation (SD) of the mean differences between the first and second administration by $\sqrt{(1-ICC)}$ ($SEM = SD \times \sqrt{1-ICC}$).²⁷ The minimal detectable change (MDC) was calculated by multiplying the SEM with $1.96 \times \sqrt{2}$ ($MDC = SEM \times 1.96 \times \sqrt{2}$).²⁷ Wilcoxon tests were used to test the differences between the first and second administration on all questions and the total score of the I-PRRS. Convergent validity was evaluated by correlating scores on the I-PRRS with those on the TSK using Spearman's rank correlation coefficient. A correlation of 0.90-1.00 was considered as very high; 0.70-0.90 as high; 0.50-0.70 as moderate; 0.30-0.50 as low; and 0.00-0.30 as negligible.²⁸ For discriminative validity, the Mann-Whitney U tests was used to compare I-PRRS scores between athletes returning to sport and those who visited their physical therapist for initial intake. Statistical significance was determined at the $p < 0.05$ level. Statistical Package for the Social Science (IBM SPSS, Chicago, IL, version 22) for Windows was used for statistical analysis.

RESULTS

Translation procedure

After forward translation, the versions from the two forward translators were merged. After that, the two forward translators needed one round before consensus was reached. The expert committee subsequently needed two rounds before consensus

was created about grammar and comprehensibility. After back translation and comparison with the original version,²⁰ a consensus round between both back translators was not required. In the Dutch translation, the word "sport" now refers to "play" in questions 1 and 2, because in Dutch "play" refers to certain sports. In questions 4 and 5, the words "during injury" were added. There were no comments on the pretest version and no further modifications were made to the final version.

Characteristics of athletes

The 168 athletes returning to sport after lower extremity injury consisted of 117 (70%) males. Median age was 25 years (range 18-42). Of the 162 injured athletes who initially visited their physical therapist, 107 (66%) were male. Median age was 25 years (range 18-45) (Table 1). Injuries that occurred in the 330 athletes were 56 ACL injuries that were operated (17.0%), 58 conservative treated knee injuries (17.6%), 54 calf injuries (16.4%), 52 hamstring injuries (15.8%), 55 ankle inversion injuries (16.7%), and 55 adductor injuries (16.7%).

The scores on each item of the I-PRRS and the total score of the I-PRRS for both athletes returning to sport and athletes initially visiting their physical therapist are presented in Table 2. Athletes who had clearance to RTS, scored significantly higher on all the I-PRRS questions and total score on the second administration ($p < 0.001$) (Table 2).

Floor or ceiling effects

No floor or ceiling effects were found. On the I-PRRS, total scores of the 168 athletes returning to sport

Table 1. Characteristics of Athletes Returning to Sport and Athletes Initially Visiting Their Physical Therapist.

	Athletes returning to sport n=168	Athletes initially visiting their physical therapist n=162
Males (%)	117 (70%)	107 (66%)
Median (min-max) age (yrs)	25 (18-42)	25 (18-45)
Median (min-max) number of training sessions per week	3 (1-12)	2.5 (1-7)
Median (min-max) number of matches per week	1 (0-4)	1 (0-3)
Median (min-max) time since injury occurrence (weeks)	9 (2-250)	2 (0-971)
Median (min-max) time in rehabilitation (weeks)	6 (1-98)	-

max=maximum score, min=minimum score, yrs = years

Table 2. Scores on the I-PRRS in Athletes Returning to Sport and Athletes Initially Visiting Their Physical Therapist.

	Athletes returning to sport n=168	Athletes initially visiting their physical therapist n=162
	Median (25 th -75 th percentile)	Median (25 th -75 th percentile)
I-PRRS question 1		
First administration	90 (80-100) *	80 (67.5-100)
Second administration	95 (90-100)	-
I-PRRS question 2		
First administration	80 (70-90) *	70 (50-90)
Second administration	90 (80-100)	-
I-PRRS question 3		
First administration	90 (80-100) *	80 (50-90)
Second administration	90 (80-100)	-
I-PRRS question 4		
First administration	85 (70-100) *	70 (50-90)
Second administration	90 (80-100)	-
I-PRRS question 5		
First administration	80 (70-90) *	70 (50-90)
Second administration	90 (80-100)	-
I-PRRS question 6		
First administration	90 (80-100) *	80 (70-100)
Second administration	90 (90-100)	-
I-PRRS Total		
First administration	51.5 (47-56) *	44 (34-53)
Second administration	54 (50.25-58)	-

* Significant differences between athletes returning to sport and athletes initially visiting their physical therapist $p < 0.001$, I-PRRS = Injury Psychological Readiness to Return to Sport scale

Table 3. ICC_a between first and second administration of I-PRRS in Athletes Returning to Sport (n = 168).

	I-PRRS question 1	I-PRRS question 2	I-PRRS question 3	I-PRRS question 4	I-PRRS question 5	I-PRRS question 6	I-PRRS Total
ICC	0.68	0.72	0.68	0.68	0.61	0.64	0.74
(95% CI)	(0.52-0.78)	(0.50-0.83)	(0.56-0.77)	(0.51-0.78)	(0.39-0.74)	(0.52-0.73)	(0.43-0.86)

ICC = Intraclass Correlation Coefficient, CI = Confidence Interval, I-PRRS = Injury Psychological Readiness to Return to Sport scale

ranged on the first administration from 29 to 60 (table 2). On the second administration, total scores ranged from 36 to 60. On both the first and second administration, no athletes had a minimum score of zero. On the first administration, nine athletes (5%) and on the second administration 20 athletes (12%) had a maximum score of 60 indicating maximum confidence.

Internal consistency

The Dutch translation of the I-PRRS had good internal consistency on the first and second administration with Cronbach's alpha 0.85 and 0.90, respectively.

Reproducibility

Good test-retest reproducibility was found on all items of the I-PRRS with ICC_a ranging from

0.61-0.72 for individual questions. The total score of the I-PRRS had good test-retest reproducibility with ICC_a 0.74 (95% CI 0.43-0.86), where 0.43 as the lower bound of 95% CI indicates at least fair reproducibility (Table 3).

The mean difference of the I-PRRS between the first and second administration was 2.74 (± 3.97). The SEM was 2.02 and the MDC 5.58 points.

Construct validity

For convergent validity, a significant ($p < 0.001$) but fair correlation was found between the total score on the I-PRRS and the total score on the TSK ($r_s = 0.41$). The negligible to fair correlations between the total score on the TSK and the individual questions of the I-PRRS were all significant ($p < 0.05$) (Table 4).

Table 4. Spearman Correlations between I-PRRS and TSK (n = 168).

	I-PRRS question 1	I-PRRS question 2	I-PRRS question 3	I-PRRS question 4	I-PRRS question 5	I-PRRS question 6	I-PRRS Total
TSK	$r_s=0.27^*$	$r_s=0.32^*$	$r_s=0.32^*$	$r_s=0.41^*$	$r_s=0.38^*$	$r_s=0.19^{**}$	$r_s=0.41^{**}$

* $p<0.05$, ** $p<0.001$, I-PRRS = Injury Psychological Readiness to Return to Sport scale, TSK = Tampa Scale of Kinesiophobia

Discriminant validity

Athletes returning to sport had significantly ($p<0.001$) higher scores on all items of the I-PRRS and the total score of the IPRRS compared to athletes who initially visited their physical therapist (Table 2).

DISCUSSION

The Dutch I-PRRS had good internal consistency and good test-retest reproducibility, where the lower bound of 95% CI indicates at least fair reproducibility in a sample of 168 athletes returning to sport after lower extremity injury. The MDC of 5.58 points on the total score indicated that with a change in score below six, there is no noticeable change outside the measurement error. The I-PRRS has a fair, statistically significant correlation with the TSK. Athletes returning to sport can be differentiated from athletes who initially visited their physical therapist on all items and on total score of the I-PRRS.

The original study developing the I-PRRS did not described measures of reproducibility.²⁰ However, a study using the Persian translation of the I-PRRS found excellent reproducibility with ICC 0.97 (95% CI 0.93-0.98)¹⁶ in athletes who missed practice and competition due to the injury for at least one week. The lower ICC of 0.74 in our study could be explained by mixed emotions at the time the athlete returns to sport. Athletes have low confidence immediately after injury and confidence increases during rehabilitation.²⁹ At the time of returning to sport, fear is reported in approximately 40% of the athletes compared to approximately 13% during rehabilitation.¹⁷ Beside positive excitement in athletes around the time RTS is allowed, fear and doubt related to the ability to RTS are prominent emotions.^{17,18,30} The one-week interval between the first and second administration could explain the differences of the I-PRRS, with mixed emotions at the moment they had clearance to RTS and more psychological readiness and

confidence after one week. This may lead to a larger confidence interval and a lower ICC as compared to Naghdi et al.¹⁶

Slagers et al.³¹ translated and validated the Anterior Cruciate Ligament Return to Sport after Injury scale (ACL-RSI) in Dutch.³¹ This questionnaire measures emotions, confidence in performance, and risk appraisal in athletes returning to sport after ACLR. The Dutch ACL-RSI showed good internal consistency (Cronbach’s alpha 0.94) and excellent test-retest reproducibility (ICC 0.93).³¹ The Dutch ACL-RSI showed a correlation of $r_s = 0.46$ ($p < 0.001$)³¹ with the TSK which was comparable to the findings of this study. The low correlation with the TSK indicates that the construct of the TSK does not correspond with the I-PRRS and ACL-RSI. Therefore, the TSK and I-PRRS should not be used interchangeably as the TSK measures fear of movement or kinesiophobia that is not similar to fear of reinjury and psychological readiness to RTS.³² However, no validated Dutch questionnaire(s) exists measuring fear, confidence, locus of control, or profile of mood states regarding RTS after lower extremity injuries in general.

Limitations

This study had some potential limitations. First, the selection of athletes with six types of injuries requiring different lengths of rehabilitation and a large range of rehabilitation time (0-98 weeks) could have led to greater ranges in scores on the I-PRRS and consequently larger confidence intervals. This may explain the lower limits of the confidence intervals of the ICC’s and the fair to low test-retest reproducibility. In addition, the definition of RTS according to the relatively large number of physical therapists could have created larger confidence intervals. However, more variation on the I-PRRS in a generalizable population could produce higher ICC’s with smaller confidence intervals. The second limitation is the

one-week interval between the first and second administration where psychological readiness could have been changed. In athletes who RTS, maximally one week after the first administration, a noticeable significantly higher score was found on the second administration on all items and on the total score of the I-PRRS. These findings could indicate that one week after clearance for RTS, athletes are more confident in returning to sport. By carrying out performance tests immediately after clearance for RTS, athletes could have become more certain and less afraid. A shorter time interval where circumstances in the psychological and physical factors may not have changed, but still protecting against memory bias, might produce smaller confidence intervals and higher ICC's and consequently a lower SEM and MDC.

In this study, the I-PRRS was investigated in high impact athletes returning to sport. While most of the injured athletes return to their preinjury sport, only about half of them actually return to their preinjury performance level.³⁻⁵ Return to performance extends the RTS element and is defined as "Returning to the defined sport and performing at or above the preinjury level".¹⁹ As a next step, it is recommended to investigate the prognostic value of the I-PRRS for return to performance in a prospective study, following athletes who actually returned to their sport. If returning to performance is related to confidence at the time the athlete returns to sport, this gives information about required scores on the I-PRRS, psychological interventions, and the chance of return to performance.

Clinical relevance

Despite physical rehabilitation and good functional scores, psychological factors and fear largely influences successful rehabilitation and RTS.^{14,18,33,34} Fear and psychological readiness is underestimated as a critical factor for RTS, not commonly monitored, and physical therapists might feel that evaluating psychological readiness is outside their scope.³⁵ Nonetheless, it is important to recognize and monitor psychological factors in addition to the physical recovery.^{14,34,36} Fear or psychological uncertainty is modifiable and can improve the readiness for RTS.^{17,18,34} Techniques addressing fear and athletic confidence can be incorporated during rehabilitation.¹³ Psychological

interventions increase confidence and reduce reinjury anxiety in athletes.^{33,37,38} The I-PRRS could be used for measuring and monitoring psychological readiness for RTS. If the athlete seems psychologically not ready to RTS, psychological interventions could be considered, possibly in collaboration with a sport psychologist.

CONCLUSIONS

The I-PRRS was successfully translated into Dutch and showed good internal consistency and good test-retest reproducibility, where the lower bound of 95% CI indicates at least fair reproducibility. To assess and monitor psychological readiness to RTS, the I-PRRS can be administered in athletes with lower extremity injuries who have clearance to return to their sport. With a change in score below six, there is no noticeable change outside the measurement error. The prognostic value of the I-PRRS in athletes who actually return to performance (or not) should be investigated in future research.

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