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Research Paper:

Validity and Reliability of the Persian Version of the Forgotten Joint Score-12 Questionnaire in Iranian Patients Following Anterior Cruciate Ligament Reconstruction

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Conflict of interest

The authors declared no conflict of interest.

ABSTRACT

Background and Objectives: Forgotten Joint Score-12 is a useful questionnaire to evaluate the level of joint awareness and patients' ability to forget the involved joint. The objective of the present study was to obtain a tool to evaluate the level of joint awareness for use in Persian-speaking patients following anterior cruciate ligament reconstruction.

Methods: The present study was a methodological study in the field of psychometrics, in which after translation and cross-cultural adaptation of the FJS-12 questionnaire according to the ISPOR method, to examine its validity, the questionnaire was given to 114 participants who had passed between 1 and 3 years of their anterior cruciate ligament reconstruction. To evaluate reliability, participants were asked to complete and resubmit the questionnaire after a week. In this study, the intraclass correlation coefficient (ICC) was used to analyze the repeatability of the questionnaire and measure Cronbach's alpha internal consistency. Structural validity was performed by calculating the correlation between the FJS-12 questionnaire and Western Ontario McMaster Osteoarthritis (WOMAC) and Knee Osteoarthritis Outcome Score (KOOS) questionnaires using Spearman's correlation coefficient. The level of ceiling and floor effect of the questionnaire was also assessed.

Results: Internal consistency and data repeatability were excellent for FJS-12 (Cronbach's α=0.950 and ICC=0.845, respectively). In examining the validity, a weak to moderate correlation was obtained between the score of the FJS-12 questionnaire and the scores of the subscales of WOMAC (r=0.34) and KOOS (r=0.34). Also, a moderate correlation was obtained between the score of the FJS-12 questionnaire and the first question of the subscale of quality of life in the KOOS questionnaire (r=0.46), which indicates the validity of the average structure of the questionnaire. The floor (4.45%) and ceiling (3.50%) effect was low.

Conclusion: According to the results of this study, the Persian version of the FJS-12 questionnaire can be used by Persian speakers. Also, this questionnaire is a reliable and valid tool to evaluate the level of joint awareness in individuals following anterior cruciate ligament reconstruction.

Keywords: Cross-cultural Adaptation, Validity, Reliability, Awareness, Anterior Cruciate Ligament Reconstruction

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Function & Disability Journal

What is "already known" in this topic:

The FJS_12 self-report questionnaire has a high validity and reliability for measuring the level of joint awareness in individuals after anterior cruciate ligament reconstruction.

What this article adds:

Persian version of the FJS_12 appeared to be a valid and reliable tool for assessing the joint awareness in Persian individual after anterior cruciate ligament reconstructionThe FJS_12 self-report questionnaire has a high validity and reliability for measuring the level of joint awareness in individuals after anterior cruciate ligament reconstruction.

Introduction

An Anterior Cruciate Ligament (ACL) rupture is one of the most common and debilitating sports injuries of the knee. ACL reconstruction operation is one of the standard treatments in the United States of America, where 200,000 injuries occur each year, and about half of them lead to reconstruction operation [1]. Often, despite successful ACL reconstruction and good ligament tension and establishing joint stability in clinical trials, patients still complain of instability and knee giving way, stating that their knee is not the same as before. This statement is considered as a kind of joint awareness that is unpleasant for patients [2].

Achieving joint unawareness, similar to a healthy joint is a benchmark in postoperative evaluations [3]. In this regard, tools are needed that can determine the outcome of the disease or treatment in an understandable and meaningful way for patients. Thus, in recent years, there has been an increasing desire the use patient-reported outcome tools to reach patients' views, beliefs, and statements in treatment [4]. There are several questionnaires to measure the outcomes of interventions on the knee, but none of them directly evaluates the level of joint awareness. The Forgotten Joint Score-12 (FJS-12) is a 12-item questionnaire designed to evaluate outcomes in patients undergoing conservative treatments and operations on knee and hip. This questionnaire measures the level of joint awareness and patients' ability to forget the involved leg during daily activities [5]. The distinguishing feature of the FJS-12 questionnaire is that it can evaluate people with a high level of performance and is much shorter and briefer than the usual knee questionnaires and has a low ceiling effect and also the ability to differentiate between good, very good and excellent [3]. This questionnaire has been translated into several languages [3, 6-17]. Due to racial, linguistic, cultural, and geographical differences between communities living in different countries, which may affect the way of completion of patient-reported outcome tools and the validity of the scores obtained from them, for using the FJS questionnaire in Iran for Iranian patients, a translation and cross cultural adaptation, then examining repeatability, validity and responsiveness of these scores in groups of similar Iranian patients are necessary. Therefore, the objective of this study was to evaluate the validity and reliability of the FJS-12 questionnaire in patients with ACL rupture after ligament reconstruction operation.

Investigation method

The present study was a methodological study in the field of psychometrics [18].

Translation and cross-cultural adaptation

Initially, the right to translate and culturally validate the FJS was obtained after contacting the original author of this instrument, and the license agreement was received and signed by both parties. In order to adapt this questionnaire with the Iranian language and culture according to the IQOLA standard method [19], the following stages were performed:

- In the first stage, two translators whose native language was Persian and had sufficient experience and mastery in translating English texts, separately translated the original version of the FJS questionnaire into Persian (translators 1 and 2).

- In the second stage, the quality of Persian version translation (in terms of clarity, use of common language, cross-cultural adaptation, and acceptability) was measured and examined in a joint meeting between translators and the expert panel and finally, according to sections

with difficult translation as well as suggested alternative words, a common Persian translation was agreed upon.

- In the third stage, the final Persian version was translated into English by two translators whose native language was English and had sufficient mastery and experience in translating texts from Persian to English (translators 3 and 4).

- In the fourth stage, the versions prepared from the first to the third stage along with the explanations were emailed to the original designer of the questionnaire. The researchers provided the original English version and the translation to a professional linguist who was an expert in translating patient-reported outcome questionnaires so that he matched them. After matching and confirming the questionnaire, the final version of the knee and hip along with the patient survey form were sent for the pilot study.

Pilot study: Finally, the translated version of the FJS-12 questionnaire was given to five patients following ACL reconstruction, as well as five patients following total knee arthroplasty, and the translated version of the FJS-12 questionnaire was given to ten patients following total hip arthroplasty, and finally, they were given a comment form on understandability, fluency of the translation, and way of responding them. Patients in the pilot study group did not participate in the next psychometric study.

Sampling method

114 Persian-speaking people who had been referred to the Tehran Energy Physiotherapy Clinic for rehabilitation treatment following ACL reconstruction in the past six months were selected by a simple and nonprobability method.

Inclusion criteria

Minimum postoperative time of six months and maximum of three years, unilateral cruciate ligament rupture, just one cruciate ligament operation, unilateral cruciate ligament operation, no operation on the opposite joint (no history of operation or fractures in the lower limbs), official language of Persian, resident in Iran, no history of L4-L5 disc herniation in the last three months, being able to write and read at the level of guidance school, and signing a consent form were the inclusion criteria.

Validation and repeatability

Participants were asked to refer to an energy physiotherapy clinic. The Persian version of the FJS-12, Knee Injury and Osteoarthritis Outcome Score (KOOS), and Western Ontario and McMaster Universities (WOMAC) questionnaires were given to answer their questions. Data related to contextual variables, such as age, sex, body mass index, date of operation, and side of the operation were recorded in the clinical information questionnaire by the researcher. After the questionnaires were completed by the participants for the first time, a copy of the FJS-12 questionnaire was given to them to take home with them, then after a one-week interval [10, 20], the participants were called and asked to again respond the questions of the FJS-12 questionnaire and send a copy of the completed questionnaire to the researcher via email, WhatsApp, or Telegram.

FJS-12

This questionnaire was designed by Behrend et al. in 2012 for patients with osteoarthritis of the knee or hip who have undergone artificial joint replacement [5]. This questionnaire consists of 12 items that increase the level of awareness of the joint during the various daily activities. Five answers are defined for each item, among which the participant can only choose one:

Never=1, almost never=2, rarely=3, sometimes=4, and most of the time=5

The highest possible score indicates the lowest level of awareness of the operated joint and the result is good. If more than four answers are lost, the total score will not be usable [5].

Final score=100–[(sum (item 01-item12)–12]/48 *100)

KOOS

KOOS is a 42-item patient-reported questionnaire that has five subscales: clinical symptoms, pain, daily life activities, sports, and recreational activities, and knee-related quality of life. A 5-point Likert scale of zero (no problem) up to 4 (maximum problem) is used to score each item, then the raw scores of each subscale are given from zero to 100, with zero representing the highest problem and 100 representing no problem. The Persian version of the KOOS questionnaire is validated to be used in Iran in patients with an ACL injury, meniscus, and simultaneous meniscus and ACL injury [21].

WOMAC

This questionnaire was designed by Bellamy and Buchanan in 1988 [22]. It consists of 33 questions that cover four dimensions: symptoms (5 questions), dryness (2 questions), pain (9 questions), and daily life function (17 questions). There are five options for each question.

In this questionnaire, higher scores indicate better status and less pain. The Persian version of this questionnaire has been translated and validated for use in patients with osteoarthritis of the knee in Iran. There is good evidence for the validity, reliability, and responsiveness of this questionnaire [23-25].

Statistical analysis

In order to evaluate the construct validity, the correlation between the score of the FJS-12 questionnaire and the scores of subscales of WOMAC and KOOS questionnaires using Spearman's correlation coefficient, the correlation between the score of the FJS-12 questionnaire, and the score of the first question of the subscale of quality of life in KOOS questionnaire, also the correlation between scores of subscales of WOMAC questionnaire with KOOS were obtained.

To evaluate the repeatability of test-retest, the correlation between scores of the FJS questionnaire in two evaluations at a one-week interval was calculated by 99 available patients. At this stage, the ICC coefficients) two-way random effects model(between the two measurements indicate the reliability of the test-retest. To examine the internal consistency, the size of Cronbach's alpha coefficient was calculated to score the entire Persian version of the FJS-12 questionnaire. To evaluate ceiling and floor effect, the percentage of patients who received the highest and lowest possible scores was calculated. Percentages above 15% were considered to indicate relevant floor and ceiling effects.

Results

Translation and cross-cultural adaption

In the translation process for item eight, an example was added to make the concept of sitting close to the ground more understandable (such as a stool). In general, the questionnaire was well understood, all 20 patients confirmed the understandability and fluency of the questionnaire and had no problem responding to the questions. Therefore, the translation process became final and the Persian version of the questionnaire became accessible for use.

Characteristics of psychometric study patients

A total of 114 people who had undergone ACL reconstruction operations in the past were included in the study. Of these, 108(94.7%) were male and 6(5.3%) were female with a Mean±SD age of 30 years (age range of 15-54). The Mean±SD body mass index was 25.87±3.5 and the mean time after the operation was 17 months (range of 6-36 months). Also, 63 cases had an operation on the right knee and 51 on the left knee (Tables 1 and 2).

Validity

In the construct validity study, the results showed that there was a weak to the moderate but significant relationship between the FJS-12 questionnaire score and the subscales scores of the WOMAC and KOOS questionnaires. The mean was close to good and the scores of the subscales of the WOMAC questionnaire were excellently correlated with KOOS (Table 3).

Table 1. Characteristics of qualitative variables of study participants

Underlying Variables		No. (%)
Gender	Male	108(94.7)
	Female	6(5.3)
Dominant foot (right/left)		21(81.6)/93(18.4)
Operative side (right/left)		51(55.3)/63(44.7)
Level of education	Guidance school	2(1.8)
	Diploma	46(40.4)
	Bachelor's degree	37(32.5)
	MA	25(21.9)
	PhD	4(3.5)
Exercise level	No sports	5(4.4)
	Amateur	21(18.4)
	Semi-professional	56(49.1)
	Professional	32(28.1)

Table 2. Characteristics of quantitative variables of the study participants

Quantitative Variables (Units)	Mean±SD
Age (y)	30.13±6.8
Weight (kg)	82.12±14
Height (m)	178.72±7.4
Body Mass Index (BMI)	25.87±3.5

Table 3. Correlation between the scores of FJS-12, WOMAC, and KOOS questionnaires and one item from KOOS

Items	Total Score of FJS-12 Questionnaire	Subscale of Symptoms of the WOMAC Questionnaire	Subscale of Pain of WOMAC Questionnaire	Subscale of Performance of WOMAC Questionnaire
The total score of the FJS-12 questionnaire	1.000	0.346	0.345	0.341
Subscale of symptoms of KOOS questionnaire	0.348	0.783	–	–
Subscale of pain of KOOS questionnaire	0.364	–	0.887	–
Subscale of performance of KOOS questionnaire	0.358	–	–	0.897
Subscale of sports of KOOS questionnaire	0.338	–	–	–
Subscale of quality of life of KOOS questionnaire	0.424	–	–	–
First item of the subscale of quality of life of KOOS (awareness of the joint)	0.459	–	–	–

Correlation is significant at the 0.01 level (2-tailed); FJS-12: Forgotten joint score-12; WOMAC: Western Ontario McMaster Osteoarthritis; and KOOS: Knee Osteoarthritis Outcome Score.

Reliability

Ninety-nine out of 114 participants completed and submitted the FJS questionnaire for the second time. In order to evaluate the relative repeatability of the test-retest of the total score of the Persian version of the FJS-12 questionnaire, the calculation of the ICC coefficient was used for the relative repeatability index. The ICC value for the overall score of the FJS-12 questionnaire was 0.845, which indicated the excellent reliability of the test-retest of the Persian version of the questionnaire.

Internal consistency

The results of the internal consistency study with Cronbach's alpha coefficient in the total score of the Persian version of the FJS-12 questionnaire showed that the internal consistency of this questionnaire was excellent (Cronbach's α=0.950).

Ceiling and floor effect

The questionnaires were completed in the presence of the researcher and after completion, the researcher checked that there was no unanswered item; therefore, there were no unanswered items in the questionnaires. The total score of the Persian version of the FJS-12 questionnaire had a lower ceiling (3.5%) and floor (4.45%) effect than all subscales of the KOOS and WOMAC questionnaires. There were no floor effects on the subscales of KOOS and WOMAC questionnaires except exercise subscale (9%) and quality of life (5.3%). The highest ceiling effect belonged to the KOOS performance subscale (18.4%) and there was no ceiling effect for KOOS and WOMAC questionnaires for symptom subscale (Table 4).

Table 4. Floor and ceiling effect of FJS-12 questionnaire score and subscales of KOOS and WOMAC questionnaires

Items	%	
	Ceiling Effect	Floor Effect
FJS-12 questionnaire	3.5	4.45
Symptom subscale of KOOS questionnaire	0	0
Pain subscale of KOOS questionnaire	14	0
Performance subscale of the KOOS questionnaire	18.4	0
Sports subscale of KOOS questionnaire	7.9	9
Quality of life subscale of KOOS questionnaire	7.9	5.3
Symptom subscale of WOMAC questionnaire	0	0
Pain subscale of WOMAC questionnaire	8.8	0
Performance subscale of WOMAC questionnaire	12.3	0

4. Discussion

Joint awareness, or the ability of patients to forget the operated joint in daily life or even during leisure activities, is a relatively new dimension of patient-reported instruments that can be measured with FJS-12 [16].

So far, many questionnaires have been translated into Persian for knee assessment, such as KOOS, WOMAC, International Knee Documentation Committee (IKDC(, TEGNER, etc., but none of them have specifically examined joint awareness. In this study and previous studies [7, 9-12, 16, 26-28], it was shown that FJS-12 is a useful assessment tool to help patients and therapists to evaluate patient satisfaction and achieve the main goal of the operation. In psychometric evaluations, a close and significant relationship was found between the total score of the FJS-12 questionnaire and the scores of subscales of WOMAC and KOOS questionnaires; significant means that the scores were close to each other and there was an excellent correlation between the scores of the subscales of the WOMAC questionnaire and KOOS, which was used as a reference for comparison. Also, the relationship between the score of the FJS-12 questionnaire and the score of the first question of the quality of life subscale in the KOOS questionnaire was obtained as close to good, which indicates the content overlap of the two and is probably due to the similar content of the two, which both questions are related to awareness of the joint.

One of the possible reasons for the lack of high correlation between the results of FJS-12 with WOMAC and KOOS questionnaires could be the incomprehensibility of the translation of the word awareness for patients, which is translated in the Persian version of the questionnaire as consciousness and in the first question of the subscale of quality of life in the KOOS questionnaire, it is translated as remembering. The ICC coefficient of this questionnaire was close to similar studies in other languages (0.8-0.95) [7, 9, 10, 12, 14, 16, 17, 27]. Also, excellent internal consistency was obtained for the total score of the Persian version of the FJS-12 questionnaire. This result indicates that there is a very high correlation between the items of the questionnaire, and the FJS-12 questionnaire measures joint awareness well. This result is similar to the results obtained in previous studies [3, 6, 7, 9, 10, 12, 16, 17, 27].

The ceiling effect above 15% is usually considered significant [29], although some studies find up to 30% acceptable [30]. In the present study, no ceiling effect was observed for the subscale of symptoms in KOOS and WOMAC questionnaires, but the ceiling effect for the total score of FJS-12 was less than the other subscales of these questionnaires, and in general, the ceiling effect of FJS-12 questionnaire was low and acceptable. Regarding the floor effect on the subscales of KOOS and WOMAC questionnaires, except for the subscale of sport (9%) and quality of life (5.3%), there was no floor effect where the ceiling effect in these two subscales was again higher than the floor effect of the total score of FJS-12. In general, the ceiling (3.5) and floor (4.45) effect of the FJS-12 questionnaire was low and below 15% and similar to the results of previous studies [3, 9, 10, 12, 17, 26, 28].

Conclusion

The results of this study showed that the Persian version of the FJS-12 questionnaire can be used by Persian speakers. Also, this questionnaire is a reliable and valid tool to evaluate the level of joint awareness in individuals seeking ACL reconstruction.

Ethical Considerations

Compliance with ethical guidelines

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Authors' contributions

Data collection and Writing – original draft: Elnaz Momeni; Conceptualization, Data interpretation,and final approval: Soheil Mansour Sohani; Funding acquisition, Resources and supervision: Shohreh Nourizadeh Dehkordi and Ali Amiri; Data analyzing and Writing – review & editing: Malek Amini.

Conflict of interest

The authors declared no conflict of interest.

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مقاله پژوهشی

روائی و پایایئ نسخه فارسی پرسشنامه FJS-21(Forgotten Joint Score12) بعد از جراحی بازسازی رباط صلیبی قدامی در ایران

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چکیده

مقدمه Forgotten Joint Score-12 یک پرسشنامهٔ قابل قبول برای سنجش میزان هوشیاری از مفصل و توانایی بیماران در فراموش کردن مفصل درگیر می باشد. هدف از مطالعه حاضر دستیابی به یک ابزار برای ارزیابی میزان هوشیاری از مفصل برای استفاده در بیماران فارسی زبان بعد از جراحی بازسازی رباط صلیبی قدامی است.

مواد و روش ها تحقیق حاضر یک مطالعهٔ متدولوژیکال در زمینه روانسنجی است، که در آن پس از ترجمه فارسی و معادل سازی فرهنگی پرسشنامهٔ FJS-12 طبق روش ISPOR ، برای بررسی روایی سازه، پرسشنامه در اختیار ۱۱۴ شرکت کننده که بین ۱ تا ۳ سال از عمل بازسازی رباط صلیبی قدامی آن ها می گذشت قرار گرفت. برای بررسی پایایی آزمون-باز آزمون از شرکت کنندگان خواسته شد با فاصلهٔ یک هفته پرسشنامه را مجدد پر و ارسال کنند. در این مطالعه برای تجزیه و تحلیل پایایی پرسشنامه ضریب ICC و برای سنجش همخوانی درونی Cronbach's α محاسبه شد. روایی سازه به وسیلهٔ محاسبهٔ همبستگی بین پرسشنامهٔ FJS-12 با پرسشنامه های WOMAC و KOOS با استفاده از آزمون آماری اسپیرمن انجام شد. همچنین میزان اثر سقف و کف پرسشنامه بررسی شد.

یافته ها همخوانی درونی و پایایی داده ها برای FJS-12 عالی به دست آمد(Cronbach's α=۰/۹۵۰، ICC=۰/۸۴۵). در بررسی روایی سازه همبستگی ضعیف تا متوسط بین نمره پرسشنامهٔ FJS-12 با نمرات خرده مقیاس های پرسشنامه های WOMAC (۰/۳۴) و KOOS(۰/۳۴-۰/۴۳)، همچنین همبستگی متوسط نزدیک به خوب بین نمره پرسشنامهٔ FJS-12 و سوال اول خرده مقیاس کیفیت زندگی در پرسشنامهٔ KOOS (۰/۴۶) بدست آمد که نشان از روایی سازه متوسط پرسشنامه مذکور دارد. اثر کف(۴/۴۵٪) و سقف(۳/۵۰٪) پایین بود.

نتیجه گیری با توجه به نتایج بدست آمده از این مطالعه، نسخه فارسی پرسشنامه FJS-12 یک ابزار پایا و روا جهت بررسی میزان هوشیاری از مفصل در افراد فارسی زبان بعد از عمل بازسازی رباط صلیبی قدامی می باشد.

کلیدواژه‌ها:
معادل سازی فرهنگی، روایی ، پایایی ، هوشیاری ، بازسازی رباط صلیبی قدامی

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