CORRESPONDENCE

Psychometric properties of the Arabic version of the Forgotten Joint Score usage in total hip arthroplasty

Waleed Albishi¹, Nasser M. AbuDujain², Orfan Arafah¹, Ibrahim S. Alshaygy¹, Abdulaziz Almaawi¹, Zyad A. Aldosari^{1*}, Mohammed N. Alhugbani¹, Omar A. Aldosari¹ and Saad M. Alangari³

Abstract

Background The ultimate goal of arthroplasty is thought to be the ability to "forget" a joint implant in daily activities. The Forgotten Joint Score (FJS-12), a score system that evaluates how much patients have been able to forget their hip or knee prosthesis, was recently published. It is based on a self-administered questionnaire that consists of 12 items. The major goal of the current study was to validate, adapt, and evaluate a Arabic-language FJS-12 (Ar-FJS-12) version in patients who had undergone total hip replacement (THA).

Materials and methods The study included 107 patients who underwent THA 1–5 years ago and completed the Ar-FJS. The construct validity of the study was evaluated using the reduced Western Ontario and McMaster Universities Osteoarthritis Index (rWOMAC). To assess the test-retest reliability, 72 people took the Ar-FJS test twice.

Results Cronbach's alpha (Internal Consistency) of the Ar-FJS-12 was 0.957 and the intraclass correlation coefficient (ICC) was 0.931 indicating high reliability. For construct validity, there was a moderate significant correlation between the Arabic the rWOMAC with r = 0.595. The ceiling effect was 1.9% (n = 2), whereas the floor effect was 1.9% (n = 2).

Conclusion The Arabic version of the FJS-12 valid, reliable tool and can be recommended for patients in Arabicspeaking communities who have undergone hip arthroplasty.

Level of evidence III, validity and reliability study.

Keywords Forgotten joint score, Orthopedic, Arabic, Hip arthroplasty, Validation, Reliability

*Correspondence: Zyad A. Aldosari Zvadaldosari177@gmail.com ¹Department of Orthopedic Surgery, College of Medicine, King Saud University, Riyadh, SA, Saudi Arabia ²Department of Family and Community Medicine, College of Medicine, King Saud University, Riyadh, SA, Saudi Arabia ³College of Medicine, King Saud University, Riyadh, Saudi Arabia

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Introduction

More than one million total hip arthroplasties are performed worldwide each year [1]. This number is predicted to double over the next few decades [2]. Successful hip arthroplasty typically depends on a surgeon-centered evaluation that considers factors such as implant lifespan, functional outcomes, and complications [1]. Recently, there has been a notable movement towards utilizing patient-reported outcomes as a crucial indicator, aligning with the main objective of hip arthroplasty, which is to provide pain relief and enhance quality of life for patients [3, 4]. This discernible movement encourages patient-centered evaluation by acknowledging the value of patients' viewpoints and experiences in determining the success of a procedure.

Among scoring systems developed to meet these demands, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and other instruments created especially for the hip [5–7]. Because of their ceiling effects, both of these standard scoring systems faced criticism. This limits the validity of its use in assessments, particularly in the field of research, potentially hindering the recognition of future improvements in patients who receive the highest score. A systematic review in 2010 assessed the usefulness of HHS by investigating its ceiling effect and revealed that the tool had an unacceptable ceiling effect of 20% [8].

In 2012, an innovative tool was created, with the aim of gauging the extent to which patients can forget about the presence of an implant during their everyday activities. It is named the "Forgotten Joint Score-12"(FJS) [9]. This revolutionary scoring system has garnered substantial attention because of its ability to assess functional outcomes in a patient-centered fashion with a remarkably low ceiling effect [10, 11]. This has resulted in the widespread adoption of such tools. This rapid adoption necessitated the translation and validation of this tool in various languages [11–14]. This tool was translated and evaluated in Arabic before by the authors specifically for knee arthroplasty patients [15].

Due to the significance of hip arthroplasty, the unique characteristics of the hip joint, differences in patient perspectives, the necessity of accurate clinical decision-making, and the importance of assessing patient-reported outcomes, having a validated and culturally tailored Arabic version of the FJS-12 for hip arthroplasty patients is crucial. As far as we know, there is no verified Arabic version of the FJS-12 for hip arthroplasty. Validating the Arabic version will boost surgeons' confidence in making well-informed decisions that are more closely in line with the patients' viewpoints and requirements.

Methods

Study design, participants, and ethical considerations

We retrospectively reviewed a single-center list of patients who underwent unilateral hip arthroplasty between 2015 and 2022 due to primary osteoartheritis, or as a sequelae of Developmental Dysplsia of Hip, avascular necrosis, and inflammatory arthritis. After determining who met for inclusion criteria, 107 native Arabic speakers were asked to participate in part. This number was based on the set threshold of 100 proposed by Terwee et al. [16]The follow up period from the operation to the response ranged between 1 and 7 years. Any patient with a cognitive disorder that hindered the ability to answer the questionnaire independently was excluded from the study. Participants below 18 years of age, as well as those who underwent resurfacing or revision procedures, were excluded from the study.

All participants provided their informed consent before the study began, emphasizing to participants that they had no commitments to the research team and that they have the right to withdraw at any time. The local Institutional Review Board reviewed and approved this study (No. E-22-7019).

Instrument translation, procedure, and data collection

The FJS-12 consists of 12 questions that assess a patient's capacity to disregard the existence of an artificial joint in daily activities. Each item is accompanied by a fivepoint Likert scale response. The unprocessed findings are transformed into a scale ranging from 0 to 100 points. The highest score indicates a favorable outcome, with the patient unaware of the prosthesis's presence 9. After obtaining a license for agreement from the FJS-12 copyright owners, our study was carried out. The forwardbackward method used to convert the FJS-12 into Arabic had been approved by the tool's original developers 17. The research team then conducted a pilot test of the questionnaire on 10 patients who underwent unilateral total hip arthroplasty to determine whether there were any problems with questionnaire comprehension. Each issue was discussed by the research team, and following a consensus, the final version was ratified.

Validation process and data acquisition

Construct and content validity are the two general forms of validity assessed for the Arabic version of the FJS. To evaluate construct validity, participants were tasked with attempting the reduced WOMAC (rWOMAC) once. The correlation coefficients of Pearson were calculated. Strong associations were indicated by values larger than 0.6 [18]. The content validity of the questionnaire describes how thoroughly it accounts for all symptoms reported by patients, which were assessed by floor and

Tab	le 1	Demograph	nic and	clinical	characteristic	s of patients
() (107)					

(10 - 107)		
Variable		Mean ± SD/ Frequency (%)
Age (years)		46.12±14.19
Sex	Male	37 (34.6)
	Female	70 (65.4)
Side	Right	58 (54.2)
	Left	49 (45.8)
Time after su	urgery (months)	36.99 ± 21.69

ceiling effects. Ceiling and floor effects in <15% of the patients were considered acceptable [16].

We assessed reliability by measuring whether the test was consistent regardless of time (test-retest reliability) and across items (internal consistency). To assess the test-retest reliability of the survey, patients were asked to complete the Arabic version of the FJS questionnaire at two separate times spaced by two weeks. The intraclass correlation coefficient (ICC) was calculated to estimate the test-retest reliability [19]. Cronbach's alpha was used to evaluate internal consistency, which is a measure of how closely connected the different parts of a measuring tool are to one another. A Cronbach's alpha of 0.80 to 0.89 generally implies acceptable internal consistency, while a value of 0.90 or higher denotes excellent internal consistency [19, 20].

Agreement is the property that quantifies the degree of variance in measurements obtained from a tool when several measurements are conducted. Two measures, the Standard Error of Measurement (SEM) and Minimal Detectable Change (MDC), were calculated to assess this agreement. The Standard Error of Measurement (SEM) is determined by using SEM = Sd × $\sqrt{(1 - R)}$, where Sd is the standard deviation of the difference between two measurements and R is the reliability of these measurements. The ICC was utilized to assess the reliability in this equation. The MDC was determined using this formula $MDC = SEM \times 1.96 \times \sqrt{2}$. The value of 1.96 was derived from the 95% confidence interval for no difference [21].

Statistical data analysis

The Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA) was used to analyze the data. To evaluate the construct validity of each scoring system, the Pearson's correlation coefficient was computed. Testretest reliability and internal consistency were evaluated using Cronbach's alpha and the intraclass correlation coefficient (ICC), respectively. Additionally, confidence intervals (CIs) at the 95% or 99% level were reported, as deemed suitable. The threshold for statistical significance was established at a p-value of less than 0.05. Futhermore, a threshold of \geq 0.3 for item-to-total correlation [22].The usage of a Bland-Altman plot was employed to visually

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Psychometric property	Value	<i>p</i> -value
Validity		
Construct validity		
rWOMAC score	0.595**	< 0.001
Content validity ($N = 107$)		
Ceiling effect	2 (1.9%)	-
Floor effect	2 (1.9%)	-
Reliability		
Internal consistency (N=111)		
Cronbach's α	0.957	-
Test-retest reliability		
Intraclass correlation coefficient	0.931 (0.890–0.957)	< 0.001
SEM	3.93	-
MDC	10.89	-

** Correlation is significant at the 0.01 level (2-tailed)

represent the disparity in scores observed between the completion of the two surveys.

Results

The initial survey was completed by a total of 107 participants. Out of the total sample, a subset of 72 individuals actively engaged in the retest phase, wherein they were administered a modified iteration of the rWOMAC questionnaire along with the translated version of the FJS-12. According to the data presented in Table 1, the mean age of the participants in the initial response was approximately 46.12±14.19 years. A significant proportion of the participants, specifically 65.4%, were identified as female. Approximately an equivalent percentage of participants underwent total hip arthroplasty on either the right or left side, with 54.2% of individuals opting for right hip replacement surgery. On average, a period of 36.99 ± 21.69 months elapsed from the time of surgery to the occurrence of a response. Upon initial completion of the Ar-FJS questionnaire, all participants reported no difficulty in comprehending the content. Every survey question achieved a response rate of 100%. In the first and second surveys, the mean FJS score was recorded as 49.22 ± 31.24 . During the retesting, this score showed an increase and was measured at 53.91 ± 29.10. The participants had an average rWOMAC score of 11.65 ± 9.59.

Validity

The Ar-FJS questionnaire demonstrated a moderate correlation with rWOMAC scores (r=0.595, p<0.001), indicating a significant association between the two measures (see Table 2). The Ar-FJS demonstrated an adequate ceiling effect of 5.6% (n=6) and a flooring effect of 3.7% (n=4). Similarly, during retesting, Ar-FJS exhibited a ceiling effect of 1.9% (n=2) and a flooring effect of 1.9% (n=2), which were comparable to the rWOMAC ceiling effect of 1.9% (n=2) and a flooring effect of 3.7% (n=4).



Fig. 1 Correlation of the Arabic Forgotten Joint Score (Ar-FJS) with the reduced Western Ontario and McMaster Universities Osteoarthritis Index (rWOMAC)

ltem	Mean±SD	Item-total correlation	Alpha, if the item removed	ICC values (95% Cl)	SEM	MDC
1	47.43±37.45	0.645	0.957	0.881 (0.810–0.925)	7.90	21.9
2	48.13 ± 40.44	0.678	0.956	0.691 (0.508–0.806)	20.29	56.24
3	52.34 ± 41.00	0.817	0.953	0.850 (0.760–0.906)	10.77	29.85
4	26.87 ± 37.26	0.662	0.957	0.749 (0.601-0.843)	15.41	42.71
5	40.19 ± 40.01	0.660	0.957	0.797 (0.676–0.873)	13.99	38.78
6	56.54 ± 40.10	0.833	0.952	0.828 (0.726-0.892)	11.92	33.04
7	55.14 ± 38.35	0.792	0.953	0.866 (0.787–0.916)	9.33	25.86
8	56.31 ± 39.17	0.797	0.953	0.846 (0.755–0.904)	10.32	28.61
9	59.81 ± 38.81	0.793	0.953	0.813 (0.702–0.883)	12.35	34.23
10	52.34 ± 39.99	0811	0.953	0.797 (0.675–0.873)	14.01	38.83
11	46.50 ± 37.37	0.871	0.951	0.876 (0.801-0.922)	8.49	23.53
12	49.07 ± 37.76	0.800	0.953	0.779 (0.647–0.861)	13.77	38.17

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Mean, item-total correlation and alpha if item removed are based on the initial testing (N=107)

The correlation coefficients for the rWOMAC scores showed support for the construct validity of the Ar-FJS, suggesting a good relationship between these measures Fig. 1.

Reliability

The Ar-FJS exhibited excellent internal consistency, as indicated by a high Cronbach's alpha value of 0.957,

indicating strong reliability among the items Table 2. This finding is further supported by the results shown in Table 3, where removing any individual item did not significantly affect the internal consistency, with values consistently above 0.95. The item-total correlation analysis revealed a strong positive correlation (>0.64) between each item and the overall FJS score, indicating that all



Fig. 2 Bland-Altman plot for test-retest agreement of the Arabic Forgotten Joint Score (Ar-FJS). The differences between the test and retest was plotted against the mean score. The line indicates the mean difference between the two \pm 1.96(SD)

items contributed to the measurement of the construct being assessed.

Except for item 2, which had an ICC of 0.691 (95% CI, 0.508-0.806), all questions had ICCs above 0.7. The intra-class correlation coefficient (ICC) between the initial and retest total scores was statistically significant and reliable. The ICC value was measured at 0.931 (95% CI, 0.890–0.957), as presented in Table 2. The test-retest mean difference was - 1.94. However, this difference was not found to be statistically significant (p = 0.275), indicating that the scores did not show a significant change over time. The Bland-Altman plot, as illustrated in Fig. 2, offers a graphical depiction of the participants' responses in relation to the average discrepancy between the two assessments. The plot demonstrates a high level of concordance between the test and retest scores, indicating a lack of discernible systematic bias. Additionally, proportional bias was evaluated using linear regression analysis, and the results indicated no significant correlation between the difference and mean (p = 0.687), suggesting that the difference in scores did not vary systematically with the mean scores. Moreover, 3.93 was the Standard Error of Measurement (SEM) for the total FJS score, indicating an average amount of measurement error associated with the individual scores. Additionally, the Minimum Detectable Change (MDC) was calculated to be 10.89, representing the smallest difference that can be considered a real change beyond the measurement error.

Discussion

Patient-reported outcomes (PROs) are essential for evaluating the efficacy and success of hip arthroplasty [4]. These results offer valuable insights into the perspectives, measurable outcomes, and post-surgery satisfaction of patients. The absence of professional tools in languages other than English often hinders their widespread use among diverse populations. We attempted to address this gap by translating and testing the Forgotten Joint Score (FJS) for hip arthroplasty in Arabic, referred to as the Ar-FJS. The FJS is a PRO instrument designed for assessing patients' awareness and joint functionality, which are essential factors in forecasting the outcome of arthroplasty. Healthcare providers can comprehensively evaluate and monitor patient's, who underwent hip arthroplasty, results in Arabic-speaking communities due to the translation and validation of the FJS.

This research primarily confirmed the validity and reliability of the Arabic version of the FJS-12 for assessing hip joint awareness and function in Arabic-speaking population. Significantly, the Arabic translation did not necessitate any alterations, and all participants encompassed in the research comprehended and provided accurate responses to the inquiries.

Existing PRO tools often lack essential factors that determine the success of arthroplasty such as natural joint awareness and joint feeling. In addition, lots of these tools exhibit significant ceiling and floor effects, which make it difficult to differentiate between excellent and good scores. To address these concerns, FJS-12 was developed by Behrend et al. The current study results are similar to those of the original study, demonstrating excellent internal consistency. The original FJS reported a high internal consistency (Cronbach $\alpha = 0.95$) [9]. In the current study, the Arabic translation was consistent with the original version and had a similar internal consistency (Cronbach $\alpha = 0.96$) Moreover, the Ar-FJS was evaluated in correlation with another widely used PRO tool, establishing its excellent validity and cultural suitability for Arabic-speaking populations.

The mean forgotten hip score was approximately 50%, which was close to that of the original study and other translations. The mean follow-up period was approximately 3 years. The average score in the original study was 59.8%, with a mean follow-up of 2.6 years [9]. The Dutch version computed an average score of 56.1% with a mean follow up of 1.3 years, the French version reported an average of 63.1%, the Persian version conveyed an average of 50.8 with an average follow up of 1.2 years [23–25].

Moreover, consistent with the original study and other translations, no floor or ceiling effects were observed. Our study reported ceiling and floor effects below the set threshold of 15% in both tests and retests. The study showed excellent test-retest reliability with an ICC of 0.931, which is consistent with other translations [11, 24–27]. This study examined the association between the Ar-FJS and other established scales, including the rWOMAC, through a comprehensive investigation. The findings of our study indicate a statistically significant positive relationship between the Ar-FJS and rWOMAC scores (r=0.595, p<0.001). This observation aligns with prior research that has documented comparable correlations (r=0.559) [26].

One limitation of this study on hip arthroplasty is its exclusive focus on the postoperative phase without considering preoperative factors. This omission restricts the assessment of the impact of preoperative conditions on the reliability and validity of the Ar-FJS in predicting patient outcomes. The responsiveness of the Ar-FJS, which tests the tool's capacity to identify clinically relevant changes over time and evaluate its longitudinal validity, was also not examined in this study. Another drawback of PRO tools is their reliance on subjective patient-reported results, which can introduce bias. Furthermore, The varying time periods post-surgery may be seen as a limitation of the study, as they could impact the Forgotten Joint Score and perhaps compromise the assessment's accuracy.

Despite these drawbacks, the Ar-FJS exhibits simplicity, reliability, validity, and consistency, and is comparable to the original English version. As it enables the evaluation of clinical outcomes in the Arabic community, its clinical importance is substantial. In both clinical practice and research, the use of Ar-FJS to recognize and evaluate patient symptoms and limitations over time offers significant benefits. Ar-FJS can improve treatment by measuring functional outcomes and proving treatment efficacy.

Conclusion

In summary, Ar-FJS utilization in hip arthroplasty shows excellent validity and reliability and can be recommended for use in clinical practice for patients undergoing hip arthroplasty in Arabic-speaking communities.

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Author contributions

W.A. supervised the study. All authors designed the study. All authors collected and analyzed the data. All authors participated in writing the manuscript. All authors read and approved the final manuscript.

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Data availability

The datasets used during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests

The authors declare no competing interests.

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