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ORIGINAL ARTICLE

Validity and reliability of Turkish version of the Forgotten Joint Score-12

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Purpose: The aim of this study was to investigate the validity and reliability of the Turkish Forgotten Joint Score-12 (FJS-12) in patients undergoing with total hip arthroplasty (THA) and total knee arthroplasty (TKA).
Methods: A total of 132 patients with cemented THA and TKA due to primary osteoarthritis were included in the study. The validity analysis was evaluated by correlating the results of the Turkish version of FJS-12 questionnaire with the Western Ontario and McMaster Universities (WOMAC) osteoarthritis score, Knee Injury and Osteoarthritis Outcome Score-Physical Function Short Form (KOOS-PS), Hip Injury and Osteoarthritis Outcome Score-Physical Function Short Form (HOOS-PS), Tampa Kinesiophobia Scale (TKS) and Short Form 12 (SF-12). Internal consistency analysis was tested with Cronbach's α. Test-retest reliability analysis was tested with Pearson correlation coefficient.
Results: The internal consistency of the Turkish FJS-12 was high (Cronbach's alpha=0.919). Test-retest reliability was found to be excellent (r=0.960, p<0.001). There were moderate to high correlations between FJS-12 and WOMAC, KOOS-PS, HOOS-PS, TKS and SF-12 (from 0.380 to 0.716, p<0.001) There was good correlation between the Turkish version of the FJS-12 and SF-12 physical component scores (r=0.379, p<0.001). There was no correlation between the FJS-12 and the SF-12 mental component score (r=0.165, p=0.058). The ceiling and floor effects were 1.5% and 4.5%, respectively.
Conclusion: The Turkish FJS-12 exhibits satisfactory psychometric properties with excellent reliability and validity in Turkish population with total hip and knee arthroplasty.
Keywords: Knee, Hip, Arthroplasty, Validity, Reliability.

Türkçe Unutulan Eklem Skoru-12'nin geçerlik ve güvenirliği

Amaç: Bu çalışmanın amacı, total kalça artroplastisi (TKA) ve total diz artroplastisi (TDA) geçiren hastalarda Unutulan Eklem Skoru-12'nin (UES-12) geçerlik ve güvenirliğini araştırmaktı.
Yöntem: Primer osteoartrit nedeniyle sementli kalça ve diz artroplastisi olan toplam 132 hasta çalışmaya dahil edildi. Geçerlik analizi, Türkçe UES-12 anketi sonuçlarının, Western Ontario McMaster Üniversiteleri Osteoartrit Skoru (WOMAC); Diz İncinme ve Osteoartrit Sonuç Skoru Fiziksel Fonksiyon Kısa Formu (KOOS-PS); Kalça İncinme ve Osteoartrit Sonuç Skoru Fiziksel Fonksiyon Kısa Formu (HOOS-PS); Tampa Kinezyofobi Ölçeği (TKS) ve Kısa Form-12 (SF-12) anket sonuçlarının korelasyonu ile yapıldı. İç tutarlık analizi Cronbach alfa ile test edildi. Test-tekrar test güvenirliğine Pearson korelasyon katsayısı ile bakıldı.
Bulgular: Türkçe UES-12'nin iç tutarlılığı yüksekti (Cronbach alfa=0.919). Test-tekrar test güvenilirliği mükemmel bulundu (r=0,96, p<0,001). UES-12 ile WOMAC, KOOS-PS, HOOS-PS, TKS ve SF-12 arasında orta seviyeden yüksek seviyede korelasyon vardı (0,380-0,716 arası). Türkçe UES-12 ile SF-12 fiziksel bölüm skoru arasında iyi derecede korelasyon vardı (r=0,379, p<0,001). Türkçe UES-12 ile SF-12 mental bölüm skoru arasında korelasyon yoktu (r=0,165, p=0,058). Taban tavan etkileri sırasıyla % 1.5 ve % 4.5'ti.
Tartışma: Kalça ve diz artroplastili Türk popülasyonunda Türkçe UES-12 mükemmel güvenilirlik ve geçerlik ile yeterli psikometrik özellikler göstermektedir.
Anahtar kelimeler: Diz, Kalça, Artroplasti, Geçerlik, Güvenirlik.

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Total joint arthroplasty is successful in decreasing pain and enhancing function in patients with osteoarthritis (OA). In Turkey, although there is not enough statistical data about the number of total knee and hip arthroplasties in a year, surgery approaches were found to be similar.[1] However, nearly 30% of patients believe their expectations have not been fully met after joint arthroplasty.[2] Even though patient-reported outcome (PRO) assessment is the primary indicator of patient satisfaction with their operated joint, "joint awareness" is a highly discriminative outcome parameter in possible patient satisfaction. It helps to provide insights from the patients' perspective of the impact of treatment on health and quality of life. Therefore, assessing patients' perception about their artificial joint is becoming more routine in clinical practice following arthroplasty.

In general, the majority of main outcome measurements following total joint arthroplasty are indicate surgeon-centered. Therefore, it is necessary to translate and culturally adapt new scores for use in PROs. There are traditional PRO measures have been developed in the 1980s for the assessment of treatment outcome after joint arthroplasty.[3,4] However, unlike other PROs "the ability to forget the artificial joint" in daily life can only be regarded as a good outcome with possible patient satisfaction. Surgeon's ratings as well as many PROs have a limited ability to differentiate between patient's outcomes. Thereby, Behrend et al have developed the "Forgotten Joint Score-12" (FJS-12) recently representing specific and subjective PRO measure to assess "joint awareness" which means the degree of acceptance of the new joint as a natural part of the body in hips and knees during various activities of daily living.[5] The FJS-12 has been validated English, German, French and Chinese Mandarin, but not in Turkish.[5-8]

It is important to generate the Turkish FJS-12 for a better understanding of the measurement properties since to the best of our knowledge, no outcome measure for the assessment of "acceptance of artificial joint" in the perspectives of Turkish patients.

The aim of this study was to translate and culturally adapt the Turkish version of the FJS-12 to aid in enhanced understanding for Turkish-speaking individuals. Additionally, we hypothesized that the Turkish adapted FJS-12 would provide adequate internal consistency and test-retest reliability as well as acceptable construct validity compared with other PRO measurements. The purpose of this study was to translate and culturally adapt the FJS-12 into Turkish and to determine its reliability and validity.

METHODS

All patients that underwent total hip arthroplasty (THA) and total knee arthroplasty (TKA) at two university hospitals within the last five years were considered for enrollment in this study. Inclusion criteria were: primary unilateral cemented THA or TKA surgery with no previous revision history and "no change" in their condition between the first and the second tests for the analysis of the test-retest reliability. Socio-demographic and clinical data including gender, age, body mass index, location of implant and time since surgery were collected.

Patients who had completed the FJS-12, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), the Hip Disability and Osteoarthritis Outcome Score-Physical Function Short-Form (HOOS-PS), the Knee Disability and Osteoarthritis Outcome Score-Physical Function Short-Form (KOOS-PS), the Tampa Scale for Kinesiophobia (TKS) and the Short Form-12 (SF-12) were included.

In the present study, these PRO measurements were chosen which seemed most appropriate for evaluation of the construct validity, as they are widely used in arthroplasty population and validated in Turkish language. One-hundred and thirty-two patients (THA; N=42, TKA; N=90) were asked all questionnaires at their follow-up visits.

Re-tests of the Turkish version of the FJS was made by call to all patients within 10 days. The FJS-12 contains 12 questions. Therefore, 10 days was chosen for the retest assessment to decrease the possibility of remembering the questions. In addition, we believe that the patients' conditions were not expected to change over this time period.

Ethical approval for the study was

obtained from the Non-Interventional Clinical Research Ethics Board (GO 15/439) and all patients signed a written informed consent form.

Translation

Translation process was performed in five stages recommended by Beaton et al.[9] The Turkish version of the FJS-12 was developed using translation/back translation method. The committee consisting of a language professional and four translators evaluated the translations and compared the discrepancies. The final approved Turkish version of Forgotten Joint Score was tested preliminary to determine comprehension of the Turkish version (Appendix).

PRO Questionnaires

Forgotten Joint Score (FJS-12): The FJS-12 was developed to identify the awareness of an artificial joint (hip or knee) during activities of daily living. It uses a 5-point Likert response format (0, never; 1, almost; 2, seldom; 3, sometimes; and 4, mostly) consisting 12 items that assess "the patient's ability to forget the artificial joint in everyday life" following activities of daily living -in bed at night; sitting in a chair (>1hr); walking (>15 min); taking bath; travelling in a car; climbing stairs; walking on uneven ground; standing up from a low sitting position; standing for long periods of time; doing housework or gardening; taking a walk or hiking; and involving in sport activity-. The raw scores are transformed to range from 0 to 100 points. High scores indicate good outcome, which means a high degree of "forgetting" the joint.[5]

Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC): Bellamy and Buchanan developed WOMAC that is a worldwide used PRO tool to assess lower limb OA at baseline assessments.[3] The questionnaire comprises 24 questions in three subscales (pain=5 questions; stiffness=2 questions; function=17 questions). The total score range is 0 (best) to 96 (worst). The Turkish version of the WOMAC was developed and its validity and reliability have been confirmed.[10]

Hip Disability and Osteoarthritis Outcome Score-Physical Function Short-Form (HOOS-PS): The HOOS-PS (with only 5 items instead of the 21 of the HOOS function, daily living and function, sports and recreational activity subscales) was used to assess physical function.[11] As with the HOOS it is intended to elicit people's opinions about the difficulties they experience with activity due to problems with their hip at baseline assessments. The measure is scored by summing the responses to the 5 items of the HOOS-PS. The interval score from 0 to 100 with zero representing no difficulty. The Turkish HOOS-PS was found to be reliable and valid for patients with primary hip osteoarthritis.[12]

Knee Disability and Osteoarthritis Outcome Score-Physical Function Short-Form (KOOS-PS): The KOOS-PS is a 7-item measure of physical functional derived from the items of the Function, daily living and Function, sports and recreational activity subscales of the KOOS.[13] As with the KOOS it is intended to elicit people's opinions about the difficulties they experience with activity due to problems with their knee at baseline assessments. The Turkish KOOS-PS was found to be reliable and valid for patients with primary knee osteoarthritis.[14]

Tampa Scale for Kinesiophobia (TSK): Kinesiohobia was measured at baseline assessments by using the valid and reliable Turkish version of the TSK.[15] The TSK questionnaire comprises 17 items that assess the subjective rating of kinesiophobia. Each item has a 4-point Likert scale with ranging from "strongly disagree" to "strongly agree". Total score range is between 17-68 which indicate high TSK value means a high degree of kinesiophobia.[16]

Short-Form-12 (SF-12): The Short-Form-12 (SF-12) was developed based on the 36-item Short-Form (SF-36) with the intent of reproducing the SF-36 in a shorter and more practical form. The SF-12® Health Survey is most likely to prove to be a satisfactory alternative to the SF-36® since several questionnaires were administered in the present study. The SF-12 is comprised of 12 items that measure physical functioning (PF), role physical (RP), role emotional (RE), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF) and mental health. The eight domain scores were aggregated into physical and mental component scores (SF-12 PCS and SF-12 MCS).[17,18] Lower SF-12 score indicated poorer physical and mental health.

Statistical analysis

Statistical analyses were carried out using IBM SPSS for Windows version 21.0 statistical software (IBM SPSS Inc., Chicago, IL, USA). Sample characteristics are presented as means and standard deviations for normal distributed data, median and min-max were used for non-normally distributed variables. The first administration of the FJS-12 data were used to assess internal consistency using Cronbach's alpha ranging from 0.70 to 0.95 was considered to be adequate.[19] Test-retest reliability analysis was done by Pearson correlation coefficient included the first and the second administration of the FJS-12 data. Values of 0.4 or higher were considered satisfactory (r=0.81-1.0, excellent; 0.61-0.80, very good; 0.41-0.60, good; 0.21-0.40, fair; and 0.00-0.20, poor).[20,21] Validity of the Turkish FJS-12 score was provided by determining its relationship with the WOMAC score, KOOS-PS, HOOS-PS, the TSK and PCS and MCS of the SF-12. Pearson correlation coefficients were calculated to assess validity for normally distributed variables (KOOS-PS, HOOS-PS, TSK, PCS and MCS of the SF-12 scores).

Spearman correlation coefficients were used for non-normally distributed variables (WOMAC pain, stiffness and function scores). Item analysis was applied to first FJS-12 scores. Corrected item total correlation and Cronbach's alpha values were given for the item analysis. Standard error of measurement (SEM) and minimal detectable change (MDC) was calculated.

Reliability

All patients who completed Turkish version of the FJS-12 were used to assess internal consistency. The Turkish version of the FJS-12 was applied and then re-applied after 10 days. The results were compared for agreement using Pearson correlation coefficient for the test-retest reliability measurement.

Validity

Construct validity of the Turkish FJS-12 was assessed by determining Pearson correlation coefficients correlation between the Turkish version of the WOMAC, KOOS-PS, HOOS-PS, TKS and SF-12 scales.

Ceiling and floor effects

Ceiling and floor effects of the Turkish version FJS-12 at the first application was assessed by calculating the proportion of the patients with the maximum (100) or (0) minimum scores relative to the total number of patients.

RESULTS

Translation process and testing

Based on the final Turkish translation, there was no necessity for the word changes in terms of understandability of the questions. However, the floor and ceiling effect analysis showed that 12th question which is "Are you aware of your artificial joint when you are doing your favorite sport?" is not directly suitable to our population for cultural reasons. Our population life style is not adapted to sport activities before or after the arthroplasty surgery. Therefore, they all answered the 12th question as "never". Patients required 10 minutes to complete the Turkish version of the FJS-12. Additionally, all patients were evaluated after an average time of 30.8±16.0 months (range 12-96 months) post-surgery. Table 1 illustrates the demographic characteristics of the patients. Table 2 demonstrates the mean values of PRO measurements.

Reliability

The internal consistency of the first assessment of the Turkish version of the FJS-12 was excellent with a Cronbach's alpha of 0.919. The test-retest reliability of the FJS-12 was found to be excellent (r=0.96, p<0.001). Item and Scale Statistics for study population is shown in Table 3.

Validity

There were moderate to high correlations between FJS-12 total score and WOMAC, KOOS-PS, HOOS-PS, TKS and SF-12 (p<0.001). The Turkish version of the FJS-12 and SF-12 PCS displayed good correlation (p<0.001) while there was no correlation between the Turkish version of the FJS-12 total score and the SF-12 MCS (p=0.058) (Table 4).

Ceiling and floor effects

The ceiling and floor effects of the sub-domains and the overall score were acceptable. The ceiling and floor effects were 1.5% and 4.5%, respectively. In addition, the SEM and MDC were found to be 3.578 points and 5.243 points, respectively.

Table 1. Demographic characteristics of the patients (N=132).

	Mean±SD
Age (years)	63.9±12.7
Body mass index (kg/m²)	29.6±5.0
Time since surgery (months)	30.8±16.0
	n (%)
Gender	
Female / Male	102 (77.3) / 30 (22.7)
Total knee arthroplasty	90 (68.2)
Total hip arthroplasty	42 (31.8)

WOMAC: the Western Ontario and McMaster Universities Osteoarthritis score. KOOS-PS: Knee Injury and Osteoarthritis Outcome Score-Physical Function Short Form. HOOS-PS: Hip Injury and Osteoarthritis Outcome Score-Physical Function Short Form.

Table 2. Mean values of patient reported outcome measurements.

	Mean±SD
Forgotten Joint Score-12 Total	64.7±24.2
KOOS-PS	37.9±13.7
HOOS-PS	22.0±18.0
Tampa Kinesiophobia Scale	40.6±9.5
Short Form-12	
Physical Component Score	39.2±12.3
Mental Component Score	43.3±16.4
	Median (Min-Max)
WOMAC	
Pain	1 (0-16)
Stiffness	1 (0-8)
Function	12 (0-64)

WOMAC: the Western Ontario and McMaster Universities Osteoarthritis score. KOOS-PS: Knee Injury and Osteoarthritis Outcome Score-Physical Function Short Form. HOOS-PS: Hip Injury and Osteoarthritis Outcome Score-Physical Function Short Form.

DISCUSSION

The most important finding of the present study was that the Turkish FJS-12 displays good measurement properties, high reliability, and appropriate validity that can be used in Turkish population to assess joint awareness following TKA and THA.

There is no consensus concerning the sample size in literature for validity and reliability studies. In the present study, the number of the patients indicate enough power to run according to the rule of seven times the number of items.[19] The original English version of the FJS-12 was successfully translated to the Turkish language.

The original English publication of FJS-12 had a higher Cronbach's alpha of 0.95 for internal consistency.[5] In the present study, the internal consistency analysis using Cronbach's alpha demonstrated similar to previously reported data.[5,6,22,23]

The FJS-12 emphasizes "awareness" unlike other PROs which is based on multiple factors pain, stiffness, difficulties in activities of daily living and behaviors. In the present study, there were negative moderate to high correlations between the Turkish version of FJS-12 and WOMAC, KOOS-PS, HOOS-PS, TKS, SF-12.

Negative correlations can be explained as the patient can "forget his joint" by higher scores that indicate good outcome, i.e., a high degree of being able to forget about affected joint in daily life comparing with improved other subjective impairments like pain, stiffness, function and kinesiophobia. As expected, there was a low correlation between the FJS-12 and SF-12 MCS. Similarly, Behrend et al stated that FJS-12 was less sensitive to measure general health.[5]

In the assessment of the presence of ceiling and floor effects, we found that the number of the patients who scored maximum or minimum values on the questionnaire was below 15% threshold. However, the floor and ceiling effect analysis showed that 12th question which is "Are you aware of your artificial joint when you are doing your favorite sport?" is not directly suitable to our population for cultural reasons. The main reason for this condition might be responsible from our population's life style that is not adapted to sport activities before or after the arthroplasty surgery. Similarly, Thienpont et al stated in their study that female and older patients often did not answer both questions 11 and 12.[6] They concluded that this patient group typically prone to performing less sport as in our study group. The level of agreement for the Turkish version of the FJS-12 may be considered excellent, with a SEM value of 3.57 points. Accordingly, the MDC was 5.24 points, which means that a change of at least 5.24

Table 3. Item and scale statistics of Forgotten Joint Score-12 Items.

Forgotten Joint Score-12 Items	Cronbach's alpha (If the item was deleted)	Corrected Item-Total Correlation
1. Awareness in bed at night?	0.916	0.605
2. Awareness sitting on a chair for more than 1 h?	0.913	0.657
3. Awareness when you are walking for more than 15 min?	0.910	0.716
4. Awareness taking a bath/shower?	0.911	0.711
5. Awareness traveling in a car?	0.915	0.627
6. Awareness climbing stairs?	0.910	0.727
7. Awareness walking on uneven ground?	0.908	0.760
8. Awareness when standing up from a low sitting position?	0.910	0.715
9. Awareness standing for long periods of time?	0.909	0.745
10. Awareness doing housework or gardening?	0.917	0.584
11. Awareness taking a walk/hiking?	0.913	0.664
12. When you are doing your favorite sport?	N/A	N/A

N/A: Not-applicable.

Table 4. Validity analysis of the Forgotten Joint Score-12 total score with patient reported outcome measurements.

	Forgotten Joint Score-12 r (p)
WOMAC	
Pain	-0.656 (<0.001)
Stiffness	-0.380 (<0.001)
Function	-0.716 (<0.001)
KOOS-PS	-0.570 (<0.001)
HOOS-PS	-0.570 (<0.001)
Tampa Kinesiophobia Scale	-0.507 (<0.001)
Short Form-12	
Physical Component Score	0.379 (<0.001)
Mental Component Score	0.165 (0.058)

WOMAC: the Western Ontario and McMaster Universities Osteoarthritis score. KOOS-PS: Knee Injury and Osteoarthritis Outcome Score-Physical Function Short Form. HOOS-PS: Hip Injury and Osteoarthritis Outcome Score-Physical Function Short Form. r: Pearson correlation coefficient.

points is needed, on a scale of 100 points, to be confident that this change is not due to random measurement error. In comparisons with earlier studies with respect to the SEM and MDC are not possible because, to our knowledge, they have not been reported before.

Limitations

The major limitation of this study is that responsiveness to the FJS-12 Turkish was not assessed which is critical to evaluate a patient's change in status. While the presented translation has been validated with this preliminary study, the Turkish form should be tested in larger and more diverse populations. Future studies are necessary to assess responsiveness of the FJS-12 in both total knee and hip arthroplasty patients.

Conclusions

Based on the results of this study, it can be concluded that there is enough evidence of acceptable reliability and validity to use the Turkish version FJS-12 in clinical practice. This is the first study to report validity and the reliability of the Turkish FJS-12 in both total knee and hip arthroplasty patients. We strongly support the inclusion of the FJS-12 to understand "joint awareness" in perspective of the patients as a new aspect in PRO assessment after total hip and knee arthroplasty surgery.

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Appendix. The Turkish version of the Forgotten Joint Score-12 (Unutulan Eklem Skoru-(UES)-12).

Unutulan Eklem Skoru-(UES)-12

Aşağıdaki 12 soru günlük yaşamda yapay kalça/diz ekleminizin (kalça/diz protezinizin) ne kadar farkında olduğunuzla ilgilidir. Lütfen her soru için bir cevap işaretleyiniz.

Yapay ekleminizin farkında mısınız?	Hiç	Neredeyse hiç	Nadiren	Bazen	Her zaman
1. Gece yatarken	☐	☐	☐	☐	☐
2. Sandalyede 1 saatten fazla otururuken	☐	☐	☐	☐	☐
3. 15 dakikadan fazla yürürken	☐	☐	☐	☐	☐
4. Banyo yaparken/duş alırken	☐	☐	☐	☐	☐
5. Araçla seyahat ederken	☐	☐	☐	☐	☐
6. Merdiven çıkarken	☐	☐	☐	☐	☐
7. Engebeli zeminde yürürken	☐	☐	☐	☐	☐
8. Alçak sandalyeden ayağa kalkarken	☐	☐	☐	☐	☐
9. Uzun süre ayakta kaldığınızda	☐	☐	☐	☐	☐
10. Ev veya bahçe işleri yaparken	☐	☐	☐	☐	☐
11. Yürüyüş yaparken (kısa bir yürüyüş)	☐	☐	☐	☐	☐
12. En sevdiğiniz sporu yaparken	☐	☐	☐	☐	☐

Skorlama: Tüm yanıtlar (0; 1; 2; 3; 4) toplanır ve tamamlanan soru sayısına bölünür. Hesaplanan ortalama değer total skorun 0-100 aralığında olması için 25 ile çarpılır. Bulunan sayı 100'den çıkarılır (yüksek skorlar ameliyat olan tarafını ne kadar oranla (%) unutabildiğini, yani hayatına adapte edebildiğini gösterir).
4 yanıttan fazla eksik varsa total skor kullanılmamalıdır.