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RESEARCH

ACCEPTABILITY, RELIABILITY AND VALIDITY OF THE TURKISH VERSION OF THE DE MORTON MOBILITY INDEX IN ELDERLY PATIENTS WITH KNEE OSTEOARTHRITIS

ABSTRACT

Introduction: The de Morton Mobility Index is a newly developed instrument that assesses the mobility in elderly. The aim of the study was to translate the de Morton Mobility Index into Turkish and investigate its psychometric properties in elderly patients with knee osteoarthritis.

Materials and Method: The Turkish version of the de Morton Mobility Index was developed using the forward-backward translation method. Patients (n=100) were assessed using the Turkish version of the index, Western Ontario and McMaster Universities Osteoarthritis Index, and Timed Up and Go test. Acceptability was assessed in terms of refusal rate, and administration time. Floor and ceiling effects and skew of the distribution were measured. Intra-class correlation coefficients, standard error of measurement, and minimal detectable change scores were calculated. The Pearson's correlation coefficients were measured.

Results: Average time to complete the index was 7.8 minutes. The response rate was 99%. The reliability analyses were conducted with 40 patients. The intra-class correlation coefficient(2,1), standard error of measurement, minimal detectable change90, and minimal detectable change95 were 0.95, 3.15, 7.33, and 8.71, respectively. The de Morton Mobility Index scores were normally distributed, and had no floor or ceiling effects. Ninety-nine knee osteoarthritis patients were analyzed for validity. Correlation coefficients between the de Morton Mobility Index, Timed Up and Go test and the Western Ontario and McMaster Universities Osteoarthritis Index physical function, pain and stiffness subscales were -0.69, -0.70, -0.39, and -0.32, respectively.

Conclusion: The Turkish version of the de Morton Mobility Index is an acceptable, reliable and valid measure for assessing mobility in elderly patients with knee osteoarthritis.

Key Words: Osteoarthritis, Knee; Geriatric Assessment; Mobility Limitation; Outcome Assessment (Health Care).

ARAŞTIRMA

DİZ OSTEOARTRİTİ OLAN YAŞLI HASTALARDA DE MORTON MOBİLİTE İNDEKSİ'NİN TÜRKÇE VERSİYONUNUN KABUL EDİLEBİLİRLİK, GEÇERLİK VE GÜVENİRLİĞİ

ÖZ

Giriş: De Morton Mobilite İndeksi yaşlılarda fonksiyonel mobiliteyi değerlendirmek için yeni geliştirilmiş bir ölçektir. Bu çalışmanın amacı, De Morton Mobilite İndeksi'ni Türkçe'ye çevirmek ve diz osteoartriti olan yaşlı hastalarda psikometrik özelliklerini araştırmaktı.

Gereç ve Yöntem: De Morton Mobilite İndeksi'nin Türkçe versiyonu çeviri-geri çeviri yöntemi ile geliştirildi. Hastalar (n=100) indeksin yeni oluşturulan Türkçe versiyonu, "The Western Ontario and McMaster Universities Osteoarthritis Index" ve "Timed Up and Go Test" kullanılarak değerlendirildi. Kabul edilebilirlik, değerlendirmeyi kabul etmeme sıklığı ve uygulama süresi ile değerlendirildi. Taban ve tavan etkisi ve dağılımların çarpıklığı ölçüldü. Ölçümlerde sınıf içi korelasyon katsayısı, standart hata ve minimum saptanabilir değişim skorları hesaplandı. Pearson korelasyon katsayısı ölçüldü.

Bulgular: İndeksin ortalama tamamlanma süresi 7.8 dakika, cevaplanma oranı ise 99% idi. Güvenilirlik analizi 40 hastada yapıldı. Sınıf içi korelasyon katsayısı (2,1), standart hata, minimum saptanabilir değişim90 ve minimum saptanabilir değişim95 değerleri sırası ile 0.95, 3.15, 7.33 ve 8.71 bulundu. De Morton Mobilite İndeksi skorlarının normal olarak dağılım gösterdiği ve taban veya tavan etkisi olmadığı görüldü. Geçerlik analizi 99 diz osteoartritli hastada değerlendirildi. De Morton Mobilite İndeksi, "Timed Up and Go Test" ve "The Western Ontario and McMaster Universities Osteoarthritis Index"in fiziksel fonksiyon, ağrı ve tutukluk alt ölçekleri arasındaki korelasyon katsayıları sırası ile -0.69, -0.70, -0.39 ve -0.32 bulundu.

Sonuç: Diz osteoartriti olan yaşlı hastalarda De Morton Mobilite İndeksi'nin Türkçe versiyonu kabul edilebilir, güvenilir ve geçerli bir mobilite değerlendirme ölçümüdür.

Anahtar Sözcükler: Diz Osteoartriti; Geriatrik Değerlendirme; Hareket Kısıtlılığı; Ölçekler (Sağlık Bilimleri).

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Introduction

Osteoarthritis (OA) is the most common form of arthritis, affecting approximately 15% of the population. Due to its predilection for lower extremity joints such as the knee and hip, OA is the leading cause of lower extremity disability among older adults (1). Felson et al. shows that the prevalence of knee OA increases with age throughout the elderly years (2). Although Turkey has a relatively younger population compared to European countries, life expectancy at birth has increased in recent years and elderly health has become a major challenge for this country as well. There is very little epidemiologic data for OA among the Turkish population. Prevalence studies have demonstrated that knee OA was estimated to be 5.35-14.8% in two different regions of Turkey (3).

Patients with knee OA suffer from a progressive loss of physical function, with increasing dependency in walking, climbing stairs, and other lower extremity tasks (4). Knee OA is sometimes referred to as the 'wear and tear' condition that clinically leads to declines in strength, joint stiffness and an increase in pain and mobility limitations (5). There is close association between mobility limitation and disability. Mobility limitations can often restrict activity and social participation, bring about isolation, anxiety and depression, and contribute to an overall poorer quality of life (6). Studies have shown that mobility limitations are a strong predictor of subsequent disabilities and the need for assistance (7). In the light of these findings, mobility limitations in patients with knee OA should be monitored closely and treated accordingly.

Several instruments such as Elderly Mobility Scale (8) and Rivermead Mobility Index (9) are used to assess mobility in elderly patients. The de Morton Mobility Index (DEMMI) is a newly developed instrument with a broad scale width that can measure mobility in many health care settings (10). It is administered by observation of mobility performance of the patient. Thus, this approach gives clinicians the opportunity to deal with the assessment limitations associated with cognitive deficits and recall bias.

Currently the DEMMI has been translated into Dutch, German, Mandarin, Thai and Danish but a Turkish translation of the DEMMI has not been previously conducted (11). The DEMMI has been validated with patients in acute (12), sub-acute (13), grade 4 OA who are candidate for replacement (14), those with Parkinson disease (15) and older adults living in the community (16). In this study, we aimed to translate the DEMMI into Turkish and to evaluate the acceptability, reliability, and validity of the Turkish version of the DEMMI in elderly patients with knee OA grades 2-3.

Materials and Method

Cross-Cultural Adaptation Process

The Turkish version of the DEMMI was developed with the forward-backward translation method (17). In the forward translation process, two independent qualified translators whose mother tongue was Turkish, translated the DEMMI to Turkish. In the backward translation processes, each of the first translations was back-translated independently from the other by two bilingual people, whose mother tongue was English. The back translators were not aware of the intent and concepts underlying the index. A multidisciplinary review committee composed of physicians, physiotherapists, and Turkish teachers compared the source and final versions of the index, and verified the cross-cultural equivalence of the source and final versions. Pre-final version of the index was applied to 10 knee OA patients as a pilot test. In this process we evaluated whether the translated index was understandable and the expressions were relevant with the Turkish culture.

Sample Size Justification

The sample size was determined based on statistical power analysis procedures using PASS 2005 software (NCSS, Kaysville, UT, USA). For the reliability, a sample size of 40 patients with two observations per patient achieves 81% power to detect an intraclass correlation of 0.80 under the alternative hypothesis when the intraclass correlation under the null hypothesis is 0.60, using a F-test with a significance level of 0.05. For the validity, the estimated sample size was calculated to be at least 84 patients under the null hypothesis (R0)=0, the value of correlation under the alternative hypothesis (R1)=0.30, Ha: R0 <> R1, ·=5% and ,=20%. Sample size was increased 20% to allow for drop outs, and set at 100 participants.

Participants

A total of 100 patients from University's Department of Physical Medicine and Rehabilitation outpatient clinic were enrolled in this study between April to December 2013. The ethics committee of the University approved the study (KA13/71). Each patient was informed about the study and gave written informed consent to participate. All patients fulfilled clinical and radiological criteria of the American College of Rheumatology for primary knee OA (18). Those

who were 65 and over, and who have been diagnosed as having grade 2-3 OA were included in the study. Patients with a history or active presence of other rheumatic diseases potentially responsible for a secondary OA, those with traumatic knee lesions, or those who scored 23 or less on the Mini-Mental Status Examination (MMSE) test were excluded from the study (19).

Instruments

De Morton Mobility Index (DEMMI)

The DEMMI is a performance based index to assess the mobility of older hospitalized patients. It measures transfers, static and dynamic balance, and walking. Interval level total scores range from "0" to "100" are obtained, where "0" represents poor mobility and "100" indicates independent mobility (13).

The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC Index)

The WOMAC Index is a disease specific, self-administered questionnaire developed to study patients with hip or knee OA. It consists of 24 questions, grouped into 3 subscales (pain, stiffness and physical function). In WOMAC index there are five alternative answers to every question (0=none, 1=mild, 2=moderate, 3=severe, 4= extreme). The maximum scores are 20 points for pain, 8 points for stiffness and 68 points for physical function. Higher scores indicate more or worse symptoms, maximal limitations and poor health. The Turkish version of WOMAC index was found valid, reliable and responsive in Turkish patients with knee OA (20).

Timed Up and Go test (TUG)

The TUG is a simple, quick and widely use clinical performance based on the measure of lower extremity function, mobility and fall risk. The TUG uses the time that a person takes to rise from a standard 45 cm chair, walk 3 m, turn around, walk back to the chair, and sit down. Using the standardized protocol, patients were asked to use their appropriate gait aid. The TUG results correlate with gait speed, balance, functional level, and the ability to go out; it can also follow change over time (21).

Procedure

All patients filled out a socio-demographic questionnaire. Two senior physiotherapists who have 10 years of experience in this clinical area administered all measurements. For validity analysis the DEMMI, WOMAC and TUG were applied one time by the first physiotherapist (Z.O.Y). Another physiotherapist (A.A) recorded the administration time for DEMMI per patient. After the first assessment and a one day interval, the DEMMI was repeated for 40 patients by the other physiotherapist (A.A) for reliability.

Statistical Analysis

In this study, we used the Statistical Package for the Social Sciences (IBM SPSS Statistics 20) for statistical analyses. Data were tested for normal distribution using the Shapiro-Wilk test. Acceptability of the DEMMI was assessed in terms of refusal rate, and administration time.

Reliability was evaluated using intra-class correlation coefficients (ICC) with a 2-way random-effects model and a 95% confidence interval (CI) for the ICC(2,1), and Bland and Altman method for assessing agreement (22). The mean difference between the two assessments with 95% limits of agreement as the mean difference (1.96 SD), and the percentage of differences that lie between $\pm 1.96\ SD_{diff}$ were calculated. ICC values were interpreted as: excellent reliability ≥0.80, moderate reliability =0.60-0.79, and questionable reliability <0.60 (13). We also calculated the standard error of measurement (SEM), and the minimal detectable change (MDC) scores.

Content validity was assessed at baseline by examining the floor and ceiling effects, and skew of the distribution in the index. We hypothesized that the skewness statistics range would range from - 1 to +1, and floor and ceiling effects would be less than 15%. Convergent and divergent construct validity were assessed at baseline by examining the correlation coefficients of the DEMMI score compared to the subscale scores of the WOMAC, and to the results of the TUG test. The correlation coefficients were interpreted as follows: ≤0.35, low or weak correlations; 0.36–0.67, modest or moderate correlations; 0.68–0.89, strong or high correlations; and ≥0.90, very high correlations (23).

RESULTS

A total of 100 patients with knee OA participated in the study however one patient did not complete the validity test. The majority of the patients were female (Table 1).

Translation

After the pilot testing, no changes were made in the items and instructions of the Turkish DEMMI.

Data Quality and Acceptability

Average time to complete the DEMMI was 7.8 min (SD=2.1). The Shapiro-Wilk tests showed that the DEMMI scores were normally distributed (p=0.117).

Table 1— Socio-Demographic Characteristics of the Patients.

Characteristics	n (%)
Sex	
Female	90 (90.0)
Male	10 (10.0)
Age, Mean (SD), Years	71.5 (6.1)
Education Status	
Primary Level	66 (66.0)
Secondary Level	4 (4.0)
High School Level	16 (16.0)
University	14 (14.0)
Employment Status	
Unemployed	1 (1.0)
Retired	29 (29.0)
Housewife	70 (70.0)
BMI	
Underweight	– (–)
Normal range	6 (6.0)
Overweight	21 (21.0)
Obese class I	40 (40.0)
Obese class II	32 (32.0)
Obese class III	1 (1.0)

BMI: Body Mass Index.

Reliability

The ICC (2,1) value for the inter-rater reliability was 0.95 (95% CI; 0.90-0.97). Mean scores of the first and the second round of the DEMMI were 71.53±15.6 and 71.03±9.03, respectively. The mean of the differences between two assessments was 0.50 (SD=6.03) (95%CI; -1.43-2.43). The percentage of differences laying between ±1.96 SD_{diff} was 95.0. The SEM was calculated to be 3.15 based on $SD_{baseline}$=14.1, and ICC= 0.95. Based on SEM=3.15, and z_{90}=1.65, and z_{95}=1.96, the MDC_{90} and MDC_{95} scores were calculated to be 7.33 and 8.71, respectively.

Validity

The skewness statistic was - 0.17. Five per cent of the patients had the highest score possible on the DEMMI. A floor effect was not present. Table 2 shows Pearson's correlation coefficients between DEMMI and WOMAC subscales, and TUG scores. The mean score on the DEMMI was 68.93 ± 14.3. The DEMMI score showed statistically significant and strong correlations with both the WOMAC physical function subscale and TUG scores. Although the correlation coefficients were significant at 0.01 levels, the DEMMI score was weakly correlated with the scores on the WOMAC pain and stiffness subscales.

Table 2— Correlation Coefficients Between DEMMI and WOMAC Subscales, and TUG Scores.

Measure		Correlation Coefficient (r)
WOMAC	Pain Subscale	-0.39*
	Stiffness Subscale	-0.32*
	Physical Function Subscale	-0.70*
TUG		-0.69*

DEMMI: de Morton Mobility Index, WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index, TUG: Timed Up and Go Test, *Correlation is significant at the 0.01 level (2-tailed).

Discussion

The current study investigated the acceptability, reliability, and validity of the Turkish version of the DEMMI. The instrument was considered acceptable by the patients with knee OA. The DEMMI scores were stable and consistent over repeated administrations. The DEMMI was significantly related to other measures of mobility and physical function.

Clinical scales must possess adequate reliability and validity to be meaningfully employed for research or clinical activities. A clinically useful scale should also be acceptable to patients and health care professionals, and practical to administer. Both in research and individual practices, it is essential to use highly reliable scales so as to reduce the chance of faulty decisions (24). Our ICC scores estimated 95% of the observed score variance was due to true score variance. This result is similar with that found in the study by Jans et al.(14) (ICC=0.85) , and shows that the Turkish version of the DEMMI is a reliable index to measure the mobility of elderly patients with knee OA. In our study, standard error of measurement was found to be 3.15, indicating that the scores did not deviate too greatly from their true value. This result is consistent with that found in a previous study (25). The small value of the SEM for the Turkish version of DEMMI indicates that measurements made by two different physiotherapists were stable and reproducible thereby implying precision in measurements. Our result revealed that the mean of the differences between two physiotherapists were narrow. This finding indicates that the assessments of the two physiotherapists were essentially equivalent. The analysis shows that the

MDC_{90} was 7.33. This means that when the change in the scores of an individual knee OA patient between two measurements reaches 7.33 points over the 100 point DEMMI scale, the clinicians may interpret the change as true and reliable, given the 90% CI.

The small percentage of patients who scored the highest and lowest possible scores on the DEMMI indicates that the scale width of the Turkish version of the DEMMI provided validity in detecting mobility changes in individuals or groups over time. The normal distribution of the Turkish version of the DEMMI scores shows its ability to adequately capture information about an individuals' mobility. Based on these findings we can report that the Turkish version of the DEMMI has a good content validity.

At the beginning of the study we hypothesized that DEMMI scores are highly correlated with the WOMAC physical function subscale score, and the TUG test (convergent validity). Our results showed significant and strong correlations among these measures supported the convergent validity of the Turkish version of the DEMMI. Similar to our results, Johnston et al.(15) found moderate to high correlations (Spear-man's rho -0.57; -0.42 to -0.69) between DEMMI and other mobility-related outcomes that also included the TUG. Their results demonstrated evidence of convergent validity.

We further hypothesized that DEMMI score would be inadequately or weakly correlated with the WOMAC pain and stiffness subscales scores (divergent validity). The weak correlations between DEMMI and WOMAC pain and stiffness subscales were found and this was the evidence of divergent validity. Jans et al. found that there was strong correlation between the DEMMI and the TUG (-0.73); and weak correlations between the DEMMI and all subscales of the WOMAC (physical function: 0.44; pain: 0.32; stiffness; 0.33). Our results were similar to those of Jans et al. except for the WOMAC physical function score (14).

Psychometric validation is the process by which an instrument is assessed for reliability and validity by mounting a series of defined tests on the population group for whom the instrument is intended. However, clinical measurement tools should have additional attributes such as responsiveness. In the current study this was the limitation and these properties were not evaluated but may need to be considered in future studies.

In conclusion, this study provides evidence that the Turkish version of the DEMMI is an acceptable, reliable and valid measure of mobility in elderly patients with knee OA. The Turkish version of the DEMMI now needs to be evaluated with different patient populations, and the responsiveness of the Turkish DEMMI may need to be evaluated in future studies.

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