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Psychometric properties of Turkish version of Jenkins sleep scale in fibromyalgia syndrome

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Abstract

Background: Fibromyalgia syndrome (FMS) has adverse effects on the quality of sleep. The aim of this study was to investigate the validity and reliability of Jenkins Sleep Scale (JSS-TR) in Turkish FMS patients.

Methods: FMS patients who met the 2016 fibromyalgia diagnostic criteria were included in the study. Clinical and demographic data of the patients were noted. The relationship between this scale and other functional parameters such as Pittsburgh Sleep Quality Index (PSQI), European Quality of Life Scale-5 Dimensions (EQ-5D), Fatigue Severity Scale (FSS), Beck Depression Inventory (BDI) was examined. Fibromyalgia Impact Questionnaire (FIQ) was used to evaluate the functional status of the patients and the progression of the disease. Test-retest reliability was calculated by re-applying the questionnaire to patients at 2-week intervals. Duloxetine treatment was initiated in newly diagnosed patients and sensitivity to change was tested at the end of the treatment. Spearman correlation coefficient was used. $P < 0.05$ was accepted as significant.

Results: Eighty-one FMS patients (71 females, 10 males) were included in the study. The mean age was 44.2 ± 10.7 years. The strongest correlation of JSS-TR was with another sleep questionnaire, PSQI (rho = 0.79, $p < 0.0005$). The correlation with other functional parameters and FIQ was moderate. In test-retest validity, intraclass correlation coefficient was found to be 0.98 ($p < 0.0005$). Chronbach α value calculated for internal consistency was found to be 0.741.

Conclusions: JSS-TR is a valid, simple and feasible sleep instrument that can be easily applied to FMS patients both in researches and clinical settings.

Keywords: Jenkins sleep scale, Fibromyalgia, Outcome measure, Validation

Introduction

Fibromyalgia syndrome (FMS) is characterised by widespread chronic pain and multiple symptoms including fatigue, sleep disturbances and cognitive complaints [1]. Sleep disturbances consist of longer wake time after sleep onset, short sleep duration, light sleep and difficulty in initiating sleep plus a restless leg, snoring, bruxism and apnoea [2, 3]. Besides this, sleeping problems are one of the most common factors perceived to worsen FMS symptoms [4]. Up to 96% of FMS patients are reported to have sleep disturbances [5–7].

Sleep evaluation can be performed via either polysomnographic measurements or patient-reported outcome tools specific to sleep quality [2]. Polysomnographic measurements are time requiring, complex and expensive. Sleep quality assessing tools such as the Pittsburgh Sleep Quality Index (PSQI) and the Jenkins Sleep Scale (JSS) are standardised widely used outcome measures [6, 8]. Most of the researchers used the PSQI for sleep evaluation in FMS [2]. However, the PSQI is composed of 19 self-rated questions, and it gives results in seven domains plus a global score [9]; so, it is also time-consuming and hard to score. On the other hand, JSS is a four-item questionnaire which is answered via a six-point Likert-type scale [8]. It is easy to score and takes less time to apply. Its validity and reliability have been studied in various diseases, including

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ankylosing spondylitis (AS), psoriatic arthritis (PsA) and rheumatoid arthritis (RA) [10–12].

The aim of this study is to assess the validity and reliability of the Turkish version of the JSS (JSS-TR) in patients with FMS.

Methods

This study was designed as a cross-sectional psychometric study.

Patients

A total of 81 patients (71 female and 10 male) aged 18–70 years old and diagnosed as having FMS, according to the ACR 2016 revised criteria, were included in the study [1]. The sample size was calculated according to the respondent-to-item ratio. Guidelines for the respondent-to-item ratio ranged from 5:1 [13] (i.e. fifty respondents for a ten-item questionnaire), 10:1 [14] to 20:1 [15]. We preferred to use the 20:1 ratio and a minimum sample size of 80 was required. Patients who were unable to fill in the questionnaire and who had other rheumatologic disease, psychiatric disorder or severe somatic diseases, such as heart or renal failure, were excluded from the study.

Questionnaires

Fibromyalgia impact questionnaire (FIQ)

It is a self-administered tool which asses the status of the FMS patient. It has been translated and validated for the Turkish population [16]. Its score ranges from 0 to 100; higher scores reflect more of an impact.

Jenkins sleep scale (JSS)

It consists of four items that evaluate sleep problems over the preceding four weeks. Each item is rated on a six-point Likert scale (not at all = 0, 1–3 days = 1, 4–7 days = 2, 8–14 days = 3, 15–21 days = 4 and 22–28 days = 5).

Pittsburgh sleep quality index (PSQI)

It assesses seven components of sleep quality, including subjective sleep quality, latency, duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications and daytime dysfunction. It is composed of 19 items, and each domain is scored 0 to 3. The global PSQI score ranges from 0 to 21. Higher scores indicate lower sleep quality. A total score > 5 indicates poor sleep quality. It has been validated for the Turkish population [17].

Fatigue severity scale (FSS)

It is a nine-item questionnaire that measures the severity of fatigue during the past week. Each item is scored from 1 to 7. The Turkish version of the FSS is valid and reliable to detect the severity of fatigue in FMS patients [18].

EuroQol quality of life (EQ-5D-3 L)

It consists of two parts, including a descriptive system plus a visual analogue scale (VAS). The descriptive system comprises five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension has three levels: no problems, some problems and extreme problems. For the VAS part, the patients were asked to rate their health status on a vertical scale (100 = best imaginable health state, 0 = worst imaginable health state). The index score is calculated from five dimensions, and it is scored from − 0.59 to 1. A score of 1 refers to excellent health. It has been validated for the Turkish population [19].

Beck depression inventory (BDI)

It is a 21-item self-administered questionnaire. Each item was scored between 0 and 3 points. The total score ranges from 0 to 63. The high score of the scale indicates the severity of the depression. Its reliability and validity were performed in a university student sample in Turkish population [20].

Statistical analysis

Reliability

It was investigated using test-retest reliability and internal consistency. For the test-retest, JSS-TR was performed two times with a two-week interval. The intraclass correlation coefficient (ICC) was used to evaluate test-retest reliability. Values between 0.5 and 0.75 indicate moderate reliability, values between 0.75 and 0.9 indicate good reliability and values greater than 0.90 indicate excellent reliability [21]. The internal consistency of the JSS-TR was assessed by the calculation of the Cronbach's alpha coefficient. If it is greater than 0.70, it is considered acceptable [14].

Validity

Convergent validity was measured via the correlation between the JSS-TR and PSQI, FIQ, FSS, EQ-5D-3 L and BDI. For the discriminative validity analysis, the correlation between the JSS-TR and age, the BMI was also evaluated. Spearman's correlation coefficient (ρ) was used to assess convergent and discriminative validity.

Responsiveness

For the responsiveness, the patients who were treated for the first time were evaluated with the JSS-TR and PSQI for responsiveness 12 weeks after treatment. Thus, the standardised response mean and effect size were calculated. For both parameters, the values between 0.2 and 0.4 indicate a small effect, between 0.5 and 0.7 indicate a medium effect and values of 0.8 and above express a greater effect [22].

In addition to the descriptive statistical methods (mean, frequency, minimum, maximum and standard deviation), the Shapiro-Wilk test was used to examine the normality of data. The statistical analysis of the data was performed using the Statistical Package for the Social Sciences (SPSS) for Windows 20 (SPSS Inc., Chicago, IL). The results were evaluated at a 95% confidence interval and a significance level of $p < 0.05$.

Results

A total of 81 FMS patients (71 females and 10 males) were recruited for this study. The demographic and clinical characteristics of the patients were given in Table 1. Sleep disturbances found in 74.1% of the FMS patients. The mean age of the patients was 44.3 ± 10.7 years, and the mean duration of the disease was 5.3 ± 12.8 months. The patients completed the JSS-TR in 1.5 min (± 30 s). The mean scores of the JSS-TR and PSQI were 11.4 and 9.1, respectively (Table 1). The floor and ceiling effects of the scale in the FMS were 2.5 and 9.9%, respectively. The internal consistency assessed with Cronbach's alpha value was found as 0.73. In the forty-three patients that completed the questionnaire twice with an interval of 2 weeks, the test-retest reliability of the JSS-TR was 0.98, indicating a low random measurement error for the scale. For the convergent validity, the strongest relationship was present between the JSS-TR and PSQI (rho = 0.79; $p < 0.0005$). There were moderate correlations between the JSS-TR and other functional scales. Convergent and discriminant validities were presented in Table 2.

The responsiveness of the JSS-TR at twelve weeks after the baseline assessment in 37 patients was shown in Table 3. The ES and the SRM of the JSS-TR were 1.03 and 1.076, respectively (Table 3). The Receiver Operating Characteristic (ROC) curve was used to determine the sensitivity, specificity and cut-off point of the JSS-TR for patients with poor sleep quality. The cut-off value of the JSS-TR, that differentiated poor sleepers from normal sleepers, was found to be 7.5. The sensitivity and specificity values of the JSS-TR were determined to be 87 and 82%, respectively (Fig. 1).

Table 1 Demographic and clinical features of the participants ($n = 81$)

	N (%)	
Gender		
Female	71 (87.7%)	
Male	10 (12.3%)	
Marital Status		
Married	63 (77.8%)	
Single	18 (22.2%)	
Education		
Primary-secondary school	55 (67.9%)	
High school	12 (14.8%)	
University	14 (17.3%)	
Work status		
Employed	24 (29.6%)	
Unemployed	55 (67.9%)	
Retired	2 (2.5%)	
	Mean ± SD	Min-Max
Age	44.28 ± 10.6	19–70
BMI	28.19 ± 4.51	21–41
Symptom duration (months)	47.88 ± 69.83	3–480
Disease duration (months)	5.31 ± 12.89	0–96
Widespread pain index	9.95 ± 3.19	5–19
Symptom severity index	8.09 ± 2.08	5–12
JSS-TR	11.4 ± 5.4	0–20
PSQI	9.1 ± 4	0–18
VAS-pain	5.6 ± 2	1–10
FSS	48.9 ± 10.9	9–63
EQ-5D Index	0.5 ± 0.3	−0.18 – 0.88
BDI	15.4 ± 9.1	0–42
FIQ	49.4 ± 15.3	7.9–76.6

N Number, *SD* standard deviation, *Min-max* Minimum-maximum, *BMI* Body mass index, *JSS-TR* Turkish version of Jenkins Sleep Scale, *PSQI* Pittsburgh Sleep Quality Index, *VAS* Visual Analogue Scale, *FSS* Fatigue Severity Scale, *EQ-5D* European Quality of Life Scale-5 Dimensions, *BDI* Beck Depression Inventory, *FIQ* Fibromyalgia Impact Questionnaire

Discussion

Our results indicate a satisfactory level of responsiveness of the JSS-TR in FMS patients. Also, the JSS-TR demonstrate good reliability and convergent validity with other outcome measures in FMS.

Cronbach's alpha coefficient for internal consistency was 0.73. It means that the JSS-TR has good reliability, which indicates a sufficient internal homogeneity. It was similar to the original article (0.79) but lower than the studies done in RA, PsA and AS [8, 10–12]. This change is mostly due to the different subject groups in the studies. Test-retest reliability was done with two-week intervals. The test-retest reliability was very good (ICC: 0.98), indicating a low random measurement error for the scale. As far as we know, there has been no previous research on the test-retest reliability of the JSS-TR. The ICC for a set of scores communicates the degree to which the participants in a sample can be differentiated from one another, despite the presence of the measurement error. The JSS-TR could consistently reproduce the same result over all the visits providing all other variables remain the same. Therefore, the JSS-TR was found as appropriate for use in longitudinal research [23]. The test-retest

Table 2 Convergent and discriminant validity of JSS-TR in FMS patients (n = 81)

Convergent validity	Spearman's rho	Significance (p)
PSQI	0.79	< 0,0005
VAS-pain	0.43	< 0.0005
FSS	0,42	< 0,0005
EQ-5D Index	-0,43	< 0,0005
BDI	0,53	< 0,0005
FIQ	0,41	< 0,0005
Discriminant validity		
Disease duration	0.052	0.647
Age	0.213	0.056
BMI	−0.001	0.994

JSS-TR Turkish version of Jenkins Sleep Scale, *FMS* Fibromyalgia syndrome, *N* Number, *PSQI* Pittsburgh Sleep Quality Index, *VAS* Visual Analogue Scale, *FSS* Fatigue Severity Scale, *EQ-5D* European Quality of Life Scale-5 Dimensions, *BDI* Beck Depression Inventory, *FIQ* Fibromyalgia Impact Questionnaire, *BMI* Body Mass Index

correlation coefficient of the PSQI was found at 0.85, which was lower than the JSS-TR [9].

Responsiveness to change is the degree with which different results are obtained after repeated applications of the same instrument when a real change in the health status has occurred. It evaluates the capacity of the JSS-TR to detect change. Most of the FMS patients have sleep problems, and it is crucial to solve these problems with effective treatment. It will be easier to monitor the effectiveness of the treatment with the help of the outcome measures. With regard to responsiveness, the ES and SRM of the JSS-TR were more than 0.8, which suggests high responsiveness.

Fibromyalgia patients with sleep disturbance were found to be 74.1%. In the study that established the 1990 fibromyalgia criteria, 73 to 85% of the patients reported fatigue, sleep disturbance and morning stiffness, a classic epidemiologic research article indicates that up to 65.7% of the patients complain about nonrestorative sleep [24].

The JSS consists of four items that assess sleep problems, including having trouble falling asleep, waking up several times per night, having trouble staying asleep and waking up feeling tired. In spite of consisting of only four items, it has been shown that it was strongly correlated with the PSQI scores (rho = 0.79, $p = 0.0001$). All of the subgroups of the PSQI were significantly correlated with the JSS-TR except the "use of sleeping medication". A previous study that validated the JSS-TR in PsA patients found similar findings with the "use of a sleeping medication subgroup" (rho = 0.136, $p = 0.319$) [11]. A previous study also demonstrated no significant difference with respect to the "use of sleep medication" scores of the PSQI in FMS patients and healthy controls [6]. According to these results, "using sleeping medication" may not be one of the dimensions in the assessment of sleep quality in FMS.

Table 3 Responsiveness of JSS-TR in FMS patients ($n = 37$)

	Mean change ± SD	ES	SRM
JSS-TR score	5.4 ± 3.6	1.03	1.076

JSS-TR Turkish version of Jenkins Sleep Scale, *FMS* Fibromyalgia Syndrome, *N* Number, *SD* Standard deviation

The main symptom of FMS is chronic pain, and chronic pain is usually associated with sleep disturbance [5, 25]. There was a reciprocal relationship between pain and sleep problems in FMS, pain may cause sleep disturbance; on the other hand, sleep disturbances may increase pain [25]. Similar to the literature, we found a significant relationship between the JSS-TR scores and VAS-pain. The JSS-TR scores increased as the pain scores increased.

Although the principal symptom of FMS is chronic pain, fatigue constitutes one of the disorder's common and disturbing problems accounting for 78–94% of the cases [26]. In a previous study with FMS patients, the global PSQI and subjective sleep quality scores were positively correlated with the multidimensional assessment of the fatigue (MAF) scale supporting our results [25]. Also, validation studies of the JSS-TR in RA, AS and PsA patients showed that moderate-strong correlations (rho: 0.47 $p < 0.0001$, rho: 0.60 $p < 0.0001$, rho: 0.45 $p < 0.0001$, consecutively) with the MAF scale similar to our results. The reason that we used the FSS instead of the MAF is that the Turkish version of the FSS was validated in FMS patients [18]. On the contrary, in the preceding study, there was no correlation between the Turkish version of the FSS and visual analogue scale (VAS)-sleep disturbance scores. They used the VAS scale for sleep disturbance instead of a comprehensive sleep scale, and this might not allow the researchers to show their relationship clearly [18].

In our study, the BDI scores were positively correlated with the JSS-TR scores. FMS patients whose BDI scores are high may have more sleep problems. Depression was found as a co-morbid condition in 17% of FMS patients with sleep disorders [27]. Similar to our results, Ulus et al. showed that subjective sleep quality and sleep disturbance subgroups of the PSQI were positively correlated with the BDI score [25]. Sleep disturbances negatively affect the quality of life in rheumatic diseases. Duruoz et al. demonstrated that the JSS-TR was related to the quality of life in RA, AS and PsA [10–12]. In accordance with this, we found that there was a moderate, negative correlation of the JSS-TR with the EQ-5D in FMS patients. We can conclude that it is important to assess the quality of life in rheumatic patients with sleep problems.

The current study demonstrated an association between the JSS-TR and FMS-specific scale (FIQ). In patients with

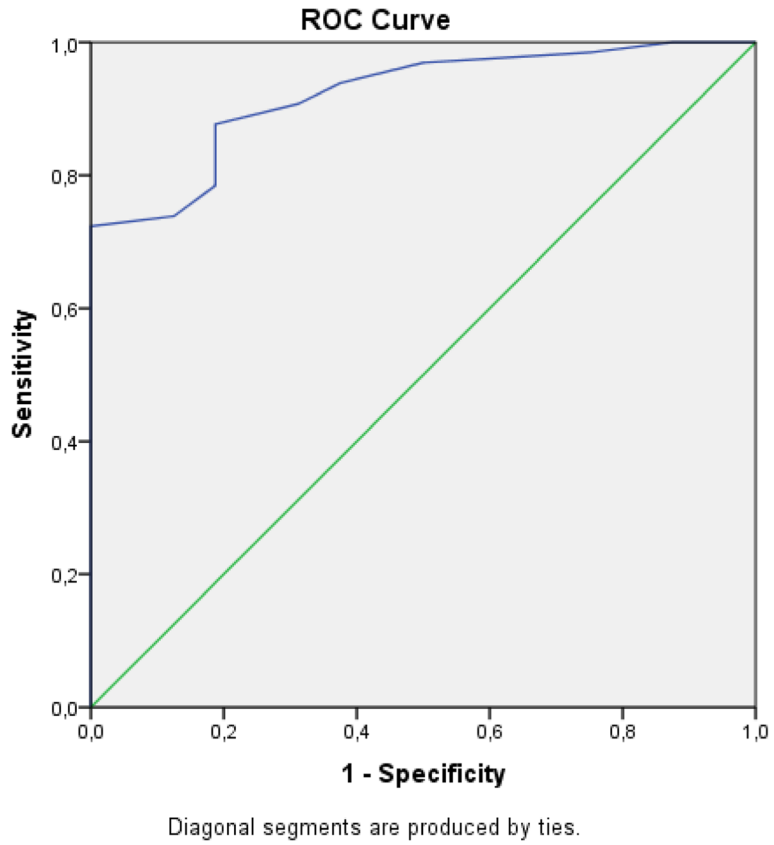

Fig. 1 The Receiver Operating Characteristic (ROC) curve of JSEQ-TR in FMS patients

worse health status and severe symptoms, the JSS-TR scores were found to be higher. In the validity study of the FIQ in a Turkish population also showed that the FIQ was strongly correlated with VAS-sleep disturbance (rho = 0.63, $p = 0.01$) [16]. On the contrary, in a different study, there was a significant but weak correlation between the total scores of the PSQI and FIQ ($p = 0.36$, $p < 0.05$) [25]. It can be concluded that the JSS-TR was superior to the PSQI for predicting the association between disease severity and sleep disturbance in FMS patients.

In the divergent validity, sleep disturbance in FMS was found to be independent of disease duration, age and BMI. These were no functional parameters that directly affected the sleep quality of FMS. Similar to our results, the PSQI was not found to be associated with disease duration in FMS [25]. There was no correlation of the JSS-TR with the mean age since the mean age of the patients was 44.2 which means that the population of the study composed of younger individuals compared to other rheumatic diseases [28]. In a previous study, daytime sleepiness was assessed using the Epworth Sleepiness Scale, and sleepiness was found to be significantly higher in obese FMS patients. However, in the same study, there was no significant difference in the mean PSQI scores of obese and non-obese FMS patients [29]. The mean score of the BMI in our study was smaller than previous studies assessing the relationship of obesity with sleep [30]. Also, in other studies that showed the validity of the JSS-TR in RA, AS and PsA demonstrated no relationship of the JSS-TR scores with the BMI [10–12]. The strength of the study was that a large sample was used to validate the four-question scale (JSS-TR). Also, we demonstrated the validity and reliability of an easily applicable sleep assessment tool in FMS patients which will allow us to use it in the clinical setting and research quickly. The limitation of this study was the majority of the patients were women. However, fibromyalgia is a disease that is more prevalent among women [31].

Conclusions

In conclusion, the JSS-TR is a valid and reliable instrument in patients with FMS in the Turkish population. Due to the sleep disturbances frequently seen in FMS patients, it will be important to assess and treat sleep problems in these patients. JSS-TR is a simple, not time-consuming and easily calculable sleep assessment tool that can be used in FMS patients.

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Authors' contributions
CUU: Designing, analysing and collecting the data, writing the manuscript. TOU: Collecting and analysing the data, writing the manuscript. Both authors read and approved the final manuscript.

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Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate
The study protocol was approved by the University of Health Sciences of Hamidiye Local Ethics Committee. Written informed consent was obtained from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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