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AN INVESTIGATION OF THE VALIDITY AND RELIABILITY OF TURKISH TAMPA KINESIOPHOBIA SCALE-SHORT FORM IN INDIVIDUALS WITH LOW BACK PAIN

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Abstract: The aim of this study was to investigate the validity and reliability of the Turkish Tampa Kinesiophobia Scale-Short Form in individuals with low back pain. A total of 111 volunteer patients aged between 30 and 65 years (mean 48±12 years) and diagnosed with mechanical low back pain were included in the study. Explanatory factor analysis (EFA) and confirmatory factor analysis (CFA) were applied to the data to test the construct validity. Item-total correlations were calculated to test item discrimination and Cronbach-α values were calculated to test reliability. To determine the criterion validity, the Turkish versions of the Visual Analog Scale (VAS), the SF-36, the Fear-Avoiding Beliefs Questionnaire (FABQ), and the Roland-Morris Disability Questionnaire (RMDQ) as well as the TSK-11, which was translated into Turkish, were administered. There was no difference between the TSK-11 test and retest measurement results (P>0.05). Cronbach α levels for test and retest were calculated as 0.74 and 0.81. The variance of the first factor in the factor analysis was 35.372%, indicating that the Turkish version of the TSK-11 consisted of one dimension. As a result of DFA, the TSK-11 fit index criteria in other fit indices. In the test-retest analyses of the Turkish version of TSK-11, intraclass correlation coefficient (ICC) values ranged from 0.403 to 0.479, while TSK-11 Cronbach's alpha values were 0.727-0.748. There was a positive relationship between TSK-11 and FABQ, RMDQ, and VAS (r=436**, 589**, 589**, respectively), and a moderate negative relationship between TSK-11 and SF-36. In our study, the Turkish version of the TSK-11 was found to be valid and reliable. The TSK-11 can be used in clinical practice and research to evaluate fear of movement in individuals with low back pain in Turkish society.

Keywords: Kinesiophobia, Validity, Reliability

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1. Introduction

Kinesiophobia is a state of fear-avoidance against activity and physical movement in case of painful or repetitive injury (Burwinkle, 2005). It is assumed that kinesiophobia is associated with increased pain, decreased physical activity level, and a poor psychological state (Shelby et al., 2012). In addition, it may cause physical and functional disability and an increase in psychological symptoms (Ishak et al., 2017).

The lumbar spine is a strong structure that provides support, strength, and flexibility to the body. In daily life, mechanical/soft tissue-originated injuries can be seen in the lumbar region. Low back pain occurs as a result of these injuries. Low back pain can be defined as pain, muscle spasm, and stiffness felt in the region between the lower costal border and the gluteal lines, with or without leg pain (Koes et al., 2006). Low back pain is a condition that is very common in the world and can cause health expenditures, job losses, and a significant decrease in quality of life (Kopec et al., 2004). Approximately 623 million people in the world experience low back pain (Buchbinder et al., 2013). In an epidemiological study conducted in two different regions in Türkiye, the prevalence of low back pain was reported as 44.1% and 46.6% (Gilgil et al., 2005; Oksüz, 2006).

It was observed that kinesiophobia plays a negative role in the rehabilitation of patients suffering from low back pain (Picavet et al., 2002). For patients with chronic low back pain, the importance of kinesiophobia increases due to disability and the long duration of symptoms. Lack of activity due to kinesiophobia can cause muscle atrophy and thus worsening of symptoms (Karayannis et al., 2013). For this reason, understanding the effects of pain-related fear and avoidance behaviors in chronic low back pain and functional disability becomes more important in the treatment of low back problems and reducing the

rate of disability (Nava-Bringas et al., 2017).

One of the questionnaires used in the evaluation of kinesiophobia is the Tampa Scale for Kinesiophobia (TSK). Vlaeyen et al. (2000) published the original scale consisting of 17 items in 1995. The scale includes injury/re-injury and fear-avoidance parameters in work-related activities. Wobby et al. (2005) published the TSK-11 in the American population in 2005, excluding 4 items (items 4, 8, 12, and 16) with reverse scoring and 2 items with weak psychometric properties (items 9 and 14). The psychometric properties of the TSK-11 were investigated in English-speaking and non-English speaking populations in patients with anterior cruciate ligament reconstruction, low back pain, neck pain, chronic pain, and musculoskeletal pain (Cai et al., 2019). The TSK allows the evaluation of kinesiophobia in relation to low back pain problems in a shorter time and in a practical way, so this study aimed to make the Turkish adaptation of TSK-11 and to investigate its validity and reliability.

2. Material and Methods

The study was carried out in Kayseri State Hospital and Yozgat Bozok University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation. A total of 111 volunteer patients aged 30-65 years (mean 48±12 years) with low back pain were included in the study. Inclusion criteria: Being in an age range of 30-65 years, being literate, being a Turkish native speaker, and having a history of low back pain for at least six months. Exclusion criteria were: Having a known autoimmune, neurological, or psychiatric disorder, having a history of fracture, infection, tumor, or surgery (for the last 3 months), and having advanced COPD or chronic heart failure.

Tampa Scale for Kinesiophobia-Short Form (TSK-11) is an 11-item scale with a 4-point Likert scoring (1=I strongly disagree, 4=I totally agree). The score range of the scale is 11-44. A high score on the scale indicates a high level of kinesiophobia (Woby et al., 2005). It is recommended in studies to use the total score.

A detailed medical history of all patients was recorded. Demographic characteristics and physical characteristics of all individuals (age, body weight, height, education level, employment status, when the low back pain started) were recorded. The data required for the study were collected face-to-face (personal interview), as it provides great advantages in terms of increasing the probability of getting extended answers and allowing multiple questions to be asked (Yalçın et al., 2021). A 5-step standard procedure was used in the Turkish adaptation of the TSK-11. Before translating the TSK-11 into Turkish and performing validity and reliability studies of the Turkish version, permission was obtained from the authors via e-mail. A five-stage protocol was adopted in the adaptation process of the questionnaire. At the first stage, a committee of Turkish–English bilinguals, who have a sufficient amount of content knowledge, independently translated the original questionnaire into the target language. At the second stage, the same committee of experts convened to analyze, discuss, and identify inappropriate terms and expressions in the translated version. At the third stage, two speakers of English with no knowledge of the content but who can speak Turkish translated the Turkish version of the questionnaire back into English. At the fourth stage, healthcare professionals examined the questionnaire in terms of cultural adaptation to minimize the differences between the original and translated versions. At the fifth stage, the Turkish version of the questionnaire was piloted in 30 patients with mechanical low back pain. Some expressions in the questionnaire were replaced with more culturally suitable ones in the target language. After completing all cultural adaptation procedures, the questionnaire was finalized (Beaton et al., 2000). Then, the reliability and validity studies were carried out. All of the patients completed the TSK-11. The Turkish versions of the Visual Analogue Scale (VAS), the SF-36, the Fear-Avoidance Beliefs Questionnaire (FABQ), and the Roland-Morris Disability Questionnaire (RMDQ) scales were also administered. After 1 week, patients completed the TSK-11 a second time for test-retest reliability analysis.

2.1. Tampa Scale for Kinesiophobia (TSK)

The TSK-11 was designed to evaluate kinesiophobia and consists of 11 questions. Each item includes strongly disagree, disagree, agree, and strongly agree options and is scored according to a 4-point Likert scale. The total score ranges from 11 to 44. A high score indicates a high level of kinesiophobia (Woby et al., 2005). Individuals were asked to tick the appropriate box for each question, and the total score was calculated.

2.2. Visual Analog Scale (VAS)

The Visual Analogue Scale is a reliable and valid pain measurement method in the evaluation of the severity of chronic pain. A 10-cm Visual Analogue Scale (VAS) was used to evaluate the pain level of the patients. The patients were informed about the use of the pain scale (0 = no pain, 5 = moderate pain, 10 = unbearable pain), and they were asked to mark the level of pain they felt during sleep, rest, and activity (walking) (Buenaventura et al., 2007).

2.3. Fear-Avoidance Beliefs Questionnaire (FABQ)

The FABQ was developed by Waddell et al. in 1993 to evaluate fear-avoidance beliefs in low back pain depending on the effects of physical activity and work (Waddell et al., 1993). The FABQ has 16 items and two subscales: physical activity and work. The physical activity section consists of 5 items and the labor section consists of 11 items. The questionnaire is a 7-point Likert-type scale. In the answers, 0 points are given to the statement of "I don't agree at all" and 6 points to the statement of "I totally agree". Both subscale scores can be used independently. Items 1, 8, 13, 14, and 16 of the original questionnaire are not included in the scoring. The Physical Activity section can get a minimum of 0 and a maximum of 24 points. The Work section can get a

minimum of 0 and a maximum of 42 points. It is accepted that there is a decrease in fear-avoidance behavior within the section as the total score approaches 0, and an increase in fear-avoidance behavior as it approaches the maximum score. Its validity and reliability study for Turkish was performed by Bingül et al. in 2008 (Bingül et al., 2013).

2.4. Roland-Morris Disability Questionnaire (RMDQ)

The functional level of the patients was evaluated with the Roland-Morris Disability Questionnaire (RMDQ). In the evaluation form consisting of 24 items, a total score was calculated by giving 1 point for "Yes" answers and 0 points for "No" answers (Küçükdeveci et al., 2001).

2.5. Short Form-36 (SF-36)

The SF-36 was used to assess the quality of life. This questionnaire was developed by Rand Corporation. It was translated into Turkish and its validity and reliability study was conducted (Koçyiğit et al., 1999). It consists of 36 items that measure 8 dimensions, namely, physical function, social function, role limitations due to physical problems, and role limitations due to emotional problems, mental health, energy/vitality, pain, and general perception of health. The subscales evaluate health from 0 to 100, where 0 indicates 'poor health' and 100 'good health'.

2.6. Power Analysis

Since the scale, whose validity and reliability were investigated, is Likert-type, the number of cases to be taken was determined to be at least 5 times or maximum 10 times the number of items (Brymann et al., 2000). In line with this information, it was planned to include at least 55 individuals in the study. A total of 111 individuals were included in the study.

2.7. Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) 25.0 and the Analysis of Moment Structures (AMOS) 24.0 packages were used for data analysis. Continuous variables are presented as mean ± standard deviation and median (minimum - largest values), and categorical variables are presented as numbers and percentages. In the analysis of the data, the items were correlated with the total score. Cronbach's alpha reliability coefficients were evaluated for the reliability and distinctiveness of the items. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed to confirm the validity of the scale design. Model fit indices were used for the reliability of CFA. Test-retest reliability of the scale and its relationship with other scales were evaluated using two-way Pearson Correlation analysis, the factor structure of the scale using EFA, Principal Components Method, and Varimax conversion. The model determined according to EFA was tested with DFA, and PCLOSE, Chi-square (χ^2), χ^2/sd, AGFI, NFI, RMSEA, NFI, IFI, RMR, TLI, GFI and CFI goodness-of-fit indices related to the model were examined as a result of the analysis (Brymann et al, 2000).

3. Results

Forty (36%) of the participants in the study were male and 71 (64%) were female patients. The physical and socio-demographic characteristics of the cases, TSK-11 scores, frequency, and percentage distribution according to various variables are given in Table 1.

Table 1. Physical and sociodemographic characteristics of the patients, TSK-11 scores, frequency and percentage distribution according to various variables

		n	%
Sex	women	71	64
	men	40	36
Age	30-39	34	31
	40-49	25	23
	50-59	23	21
	60 or more	29	29
Marital status	Married	99	89.2
	Single	12	10.8
BMI(kg/m$^{2)}$	18,5 - 24,9	41	36.9
	25 - 29,9	26	23.4
	30 - 34,9	26	23.4
	35 - 39,9	15	13.5
	40 or more	3	2.7
Low back pain duration	6 months - 1 year	35	31.5
	13 months - 2 years	21	18.9
	25 months - 5 years	16	14.4
	5 years or more	39	35.1
	Total	111	100
	Mean±SD		
TSK-11 1. Scores	29.45±5.229		
TSK-11 Re-test	29.16±5.061		

3.1. Validity Results

The correlation (r) value of the item-reminder coefficients was not found below 0.30. CFA was applied to the data to test the construct validity. Thus, it was examined whether TSK-11 was explained in three factors (three dimensions) or two factors as defined in the literature. As a result of CFA, items needing modification, that had a high load on more than one factor, or that had a similar meaning with another item in the scale, and that caused significant decreases in χ^2 value when removed, were removed from the draft scale. The total explanation variance of the factors was calculated as 49,716. Kaiser Meyer Olkin (KMO)= 0.815, P= 0.000, Approximate Chi-Square= 322,306, anti-image correlation values less than 0.05 were excluded from the evaluation. The varimax method was preferred as the factor rotation method performed by EFA. In the factor analysis, the variance explained by the first factor (35.372%) was 30% or more, indicating that the Turkish version of the TSK-11 consisted of one dimension. Item-total correlations were calculated to test item discrimination and Cronbach's α values were calculated to test reliability. The line graph of the factor eigenvalues of the TSK-11 is shown in Figure 1.

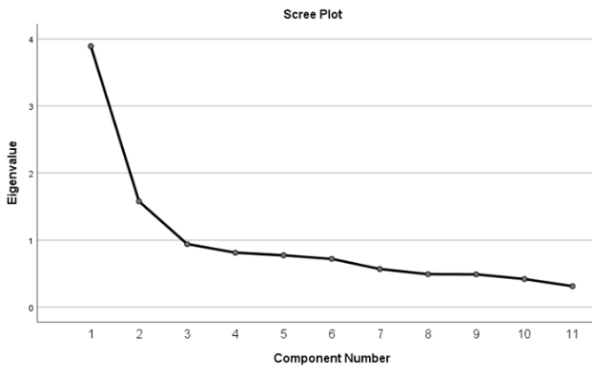

Figure 1. The line graph of the factor eigenvalues of the TSK-11.

3.1.1. Construct validity, internal consistency, and test-retest reliability

In the factor analysis, the variance explained by the first factor (35.372%) was 30% or more, indicating that the Turkish version of the TSK-11 had a one-dimensional structure. When the intraclass correlation coefficient (ICC) values obtained from the test-retest examinations of the Turkish version of the TSK-11 items were examined, the ICC value ranged from 0.403 to 0.479, while the TSK-11 Cronbach's alpha values were 0.727-0.748. Since a scale is considered reliable when the Cronbach's Alpha value was 0.70 and above, the TSK-11 was found to be a reliable questionnaire. Table 2 shows internal consistency and test-retest reliability with matrix factor analysis of the TSK-11.

CFA analysis was performed to confirm how well it could measure features corresponding to the resulting structure after EFA and to confirm whether the pattern was confirmed. CFA was performed on the same dataset for single-factor constructs. The relationship between latent and observed variables and the variance of observed error variables are shown in Figure 2.

When the other fit indices were examined as a result of CFA, it was seen that the scale met the criteria of the fit indices. Therefore, the validity of the items obtained as a result of the TSK-11 adaptation process, as determined by EFA, was also confirmed by CFA. The fit indices are shown in Table 3.

Table 2. Component matrix factor analysis and Cronbach's Alpha of items of Turkish version of TKÖ-11 (N=111)

Statements	Factor	Communalities	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
S01	0.548	0.454	0.437	0.73
S02	0.689	0.514	0.479	0.724
S03	0.624	0.401	0.451	0.741
S04	0.636	0.405	0.459	0.741
S05	0.795	0.637	0.445	0.73
S06	0.669	0.474	0.475	0.727
S07	0.64	0.423	0.403	0.748
S08	0.537	0.401	0.418	0.734
S09	0.647	0.437	0.243	0.755
S10	0.703	0.605	0.516	0.72
S11	0.849	0.723	0.401	0.735
Eigenvalue			24.182	
Explained variance			49.72%	

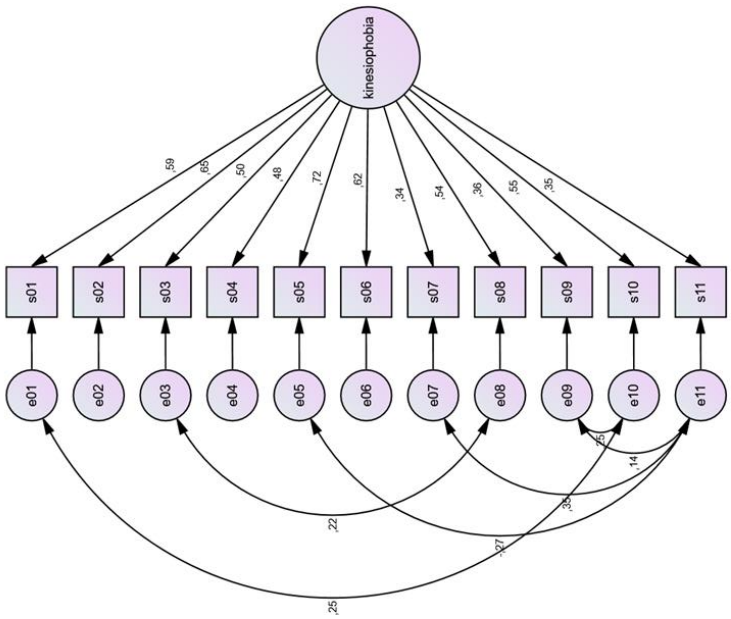

Figure 2. CFA results and error variances according to the Structural Equation Model of TSK-11.

Table 3. Goodness-of-fit

Fit Indices	Perfect Fit	Acceptable Fit	TKÖ-11
AGFI	0.90<RFI≤1.00	0.85<RFI≤0.90	0.864
CFI	0.97≤CFI≤1.00	0.95≤CFI≤0.97	0.954
GFI	0.90<RFI≤1.00	0.85<RFI≤0.90	0.922
IFI	0.95≤IFI≤ 1.00	0.90≤IFI≤0.95	0.957
NFI	0.95≤NFI≤1.00	0.90≤ NFI≤0.95	0.849
RMR	0.00≤ RMR ≤0.05	0.06 ≤ RMR ≤0.08	0.047
RMSEA	0.00≤RMSEA≤0.05	0.05<RMSEA≤0.08	0.055
TLI	0.95≤TLI≤1.00	0.90≤TLI≤0.95	0.934
χ2/df	0.00 ≤ χ^2/df ≤2.00	2.00 < χ^2/df ≤ 5.00	1.338
PCLOSE	<0.05		.00

Table 4. Normality tests comparison of TSK-11

	Kolmogorov-Smirnov[a]			Shapiro-Wilk			Ortalama	Standart
	Statistic	Df	Sig.	Statistic	df	Sig.		Hata
1. Scores	0.092	111	0.021	0.979	111	0.070	29.45	5.229
Test-retest	0.109	111	0.002	0.978	111	0.064	29.16	5.061

Table 5. The correlations between the Turkish version of the TSK-11 and the FABQ, RMDQ, SF-36 and NRS

					SF-36						
FABQ-1	FABQ-2	PF	RP	RE	E	MH	SF	P	HP	RMDQ	NRS
0.358	0.436	-0.489	-0.429	-0.388	-0.239	-0.301	-0.277	-0.595	-0.533	0.589	0.514

PF= physical function, RP= role physical, RE= role emotional, E= energy, MH= mental health, SF= social functionality, P= pain, HP= health perception, RMDA= Roland-Morris disabilite anketi, NRS= numeric rating scale.

3.2. Reliability Analysis

In addition, an equal number of new cohorts were included in the study to determine the test-retest reliability value of the TSK-11. The scale was applied twice, 7 days apart. The Pearson correlation coefficient value between the first and last measurements was calculated. It was seen that the distribution of the first measurement and the last measurement was normal, and the test-retest reliability of the scale of openness to change of managers in terms of management processes was high. The results of the Kolmogorov-Smirnov test performed to confirm the normality of the distribution of the two applications are shown in Table 4.

3.2.1. Criterion validity

Two-way positive correlation was found between the TSK-11 and the RMDQ, FABQ, and NRS. Negative correlation was found between the TSK-11 and SF-36 subsections. The correlations between the Turkish version of the TSK-11 and the FABQ, RMDQ, SF-36, and NRS are shown in Table 5.

3.2.2. Floor and ceiling effects

No floor or ceiling effects were observed in this study. This proved to be a good distribution for the Turkish version of the TSK-11. All participants completed the survey without difficulty and without any problems with missing or multiple responses.

4. Discussion

To the best of our knowledge, this is the first study in the literature on the translation and adaptation of the TSK-11 scale into Turkish. The Turkish version of the TSK-11 was found to be valid and reliable. It was found to be a suitable measurement tool for use in Turkish society.

For the reliability study, test-retest reliability and internal consistency were checked. For test-retest reliability, the TSK-11 was administered to the same group twice, with an interval of 1 week. In another study investigating the psychometric properties of the TSK-11 in geriatric individuals with chronic pain, the test-retest interval was set as 14 days, and despite this long period, the use of the questionnaire in geriatric individuals with chronic pain was found to be highly reliable (Larsson et al., 2014). The scores received in the 1st and 2nd measurements were 29.45±5.229 - 29.16±5.061, respectively. Cronbach's α levels were calculated as 0.74 and 0.81 for the test and retest in the Turkish version of the TSK-11. Cronbach α values were determined as 0.883 and 0.80, respectively, in the Chinese and Arabic versions of the TSK-11 (Cai et al., 2019; Al-Shudifat et al., 2020). These results showed that the Turkish version of the TSK-11 had similar reliability.

In our study, the ICC value method was used to determine the internal consistency of the TSK-11. An ICC coefficient 0.00≤α<0.40 indicates that the scale is not reliable; if it is 0.40≤α<0.60, the scale is a little reliable; if it is 0.60≤α<0.80, the scale is quite reliable; and if it is 0.80≤α<1.00, the scale is considered as highly reliable (Hayran, 2011). As a result of our study, the internal consistency value of the questions in TSK-11 was between 0.720 and 0.755, which was considered quite

reliable. In the TSK-11 Arabic version, this value was 0.80 (Al-Shudifat et al., 2020).

Confirmatory factor analysis (CFA) was performed to examine the structural validity of the scale. Factor analysis evaluates whether the items in the scale can be grouped under different dimensions. Factor analysis studies are concerned with items with a factor load greater than 0.30 and factors with an eigenvalue greater than 1 (Tabachnick et al., 2012). CFA is a method used to ensure construct validity if a theory-based model has been developed or a previously developed scale is reapplied, that is, if a theoretical construct is available. In the literature, different models emerged as a result of the factor analysis of the TSK. In the TSK Netherlands version, 4 factors were defined, consisting of harm, fear of (re)injury, importance of exercise, and avoidance of activity (Vlaeyen et al, 1995). Geisser et al. (2000) defined a 2-factor structure for TSK-13. The fact that the variance explained by the first factor (35.372%) in the factor analysis of the Turkish version of TSK-11 was 30% or more showed us that the Turkish version of the TSK-11 consisted of one dimension. The differences in TSK factor analysis results may be due to differences in patient groups and populations. No item was removed from the scale because the factor loads of the TSK-11 items had a high value (0.54-0.84). This result supported the construct validity of the scores of the items.

In order to measure the criterion validity, correlation degrees between the TSK-11 and the FABQ-1, FABQ-2, SF-36 sub-dimensions, RMDQ, and NRS scales were calculated. A significant correlation was found between TSK-11 total scores and other scale scores. While there was a moderate negative correlation between SF-36 and TSK-11, a moderate positive correlation was found between TSK-11 and FABQ, RMDQ, and NRS. Uçurum et al. (2018) found a weak positive correlation between pain and kinesiophobia in patients with low back pain, and a weak negative correlation between quality of life and kinesiophobia. Swinkels et al. (2003) investigated the psychometric properties of the fear-avoidance questionnaire and TSK measurements in patients with acute low back pain and found a strong correlation between the two scales. These results showed that we obtained results in accordance with the literature and TSK-11 had criterion validity.

With this study, it was shown that the TSK-11 is a tool that can be easily used by health professionals in the clinic to determine the causes of fear of movement in individuals with low back pain. Clinicians can use standard rehabilitation approaches more effectively if they can identify the presence of kinesiophobia before planning any exercise therapy. We think that it is necessary to examine the validity and reliability of the TSK-11 questionnaire in future studies, especially in other chronic diseases. We think that this questionnaire can be used more frequently in clinical and research studies due to the popularity of practical scales that can be applied in a short time.

5. Conclusion

The TSK-11 was culturally adapted to Turkish. When we look at these current results, the TSK-11 is acceptable, reliable, and valid in Turkish-speaking patients with low back pain. The TSK-11 will enable the evaluation of kinesiophobia in clinical practice and research in a shorter time.

Limitations

First, these results were applied to patients with low back pain in Kayseri and Yozgat provinces in Türkiye. Therefore, the findings may not be generalizable to individuals living in other geographic areas. Second, the criterion validity analysis of the TSK-11 could not be made in this study because there was no other measurement accepted as the international gold standard evaluating kinesiophobia.

Author Contributions

The percentage of the author(s) contributions is present below. All authors reviewed and approved final version of the manuscript.

	H.A.	A.G.	H.D.	Ö.B.
C	40	10	20	30
D	100			
S	20	40	40	
DCP		50		50
DAI			100	
L	30	20	30	20
W	50	20	20	10
CR	40	20	20	20
SR	40	20	20	20
PM	40	20	20	20
FA	60	20	20	

C=Concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

Conflict of Interest

The authors declared that there is no conflict of interest.

Ethical Approval/Informed Consent

The patients were informed about the study based on the Declaration of Helsinki and "Informed Consent" was obtained. Permission was obtained from Yozgat Bozok University Clinical Research Ethics Committee (approval date: November 11, 2020, protocol code: 2017-KAEK-189_2020.11.11_04) before the commencement of the study. In the study, first of all, the cultural adaptation of the TSK-11 for the Turkish population was performed.

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