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TURKISH RELIABILITY AND VALIDITY OF POSTURAL AWARENESS SCALE IN OFFICE WORKERS

ORIGINAL ARTICLE

ABSTRACT

Purpose: The aim of this study was to perform the Turkish cross-cultural adaptation of the Postural Awareness Scale and test its reliability and validity on office workers.

Methods: The study was conducted at Bitlis Eren University, and 180 office workers were included in the study. The average age of the participants was 39.05±8.44, and 74.4% were male. As a first step, forward and backward translations of the scale were performed. Then, the final version of the scale was developed and introduced to all the participants by face-to-face interviews. The internal consistency and construct validity of the scale was assessed with internal consistency analysis, explanatory and confirmatory analyses.

Results: The Turkish version of the Postural Awareness Scale, consisting of eleven items, had satisfactory reliability (total α score = .854, factor 1 score = .886, factor 2 score = .777). The reliability of the scale was confirmed by the test-retest analysis performed with a two-week interval as well (r = .831). In explanatory factor analysis, twelfth item was loaded on both factors. In confirmatory factor analysis, factor load of the 12th item was low (0.21). For these reasons, the 12th item was removed from the scale.

Conclusion: The Turkish version of the Postural Awareness Scale, consisting of eleven items, is a reliable and valid scale for the assessment of postural awareness in office workers.

Key words: Awareness; Office workers; Posture

POSTÜRAL FARKINDALIK ÖLÇEĞİNİN OFİS ÇALIŞANLARINDA TÜRKÇE GÜVENİRLİK VE GEÇERLİLİĞİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu çalışmanın amacı Postüral Farkındalık Ölçeğinin Türkçe kültürel adaptasyonu ile ofis çalışanlarındaki güvenirlik ve geçerliliğini yapmaktı.

Yöntem: Çalışma Bitlis Eren Üniversitesi'nde yürütüldü ve çalışmaya 180 ofis çalışanı dahil edildi. Çalışmaya dahil edilen katılımcıların yaş ortalamaları 39,05±8,44'tü ve %74,4'ü erkekti. İlk adım olarak ölçeğin ileri geri çevirileri yapıldı. Ardından ölçeğin son hali geliştirildi ve katılımcılara yüz yüze görüşülerek uygulandı. Ölçeğin iç tutarlılığı ve yapısal geçerliliği iç tutarlılık analizi, açıklayıcı ve doğrulayıcı faktör analizleri ile değerlendirildi.

Sonuçlar: On bir maddeden oluşan Postüral Farkındalık Ölçeği Türkçe versiyonu güvenirliği yeterli düzeydeydi (toplam α değeri = .854, faktör 1 = .886, faktör 2 = .777). Ölçek güvenirliği iki hafta arayla yapılan test tekrar testi ile onaylandı (r = .831). Açıklayıcı faktör analizinde on ikinci madde her iki faktöre de yüklenmekteydi. Doğrulayıcı faktör analizinde on ikinci maddenin faktör yükü düşüktü (0.21). Bu sebeplerden dolayı on ikinci madde ölçekten çıkarıldı.

Tartışma: On bir maddeden oluşan Postüral Farkındalık Ölçeği Türkçe versiyonu ofis çalışanlarında postüral farkındalığın değerlendirmesinde güvenilir ve geçerli bir ölçektir.

Anahtar kelimeler: Farkındalık, Ofis çalışanları, Postür

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INTRODUCTION

Posture is the position and alignment of the body parts with respect to each other and has a constantly changing dynamic based on the needs of the individual (1,2). Inherent dynamism in posture has led to the optimal posture concept. Optimal posture is the balance in the musculoskeletal system that prevents injury risk (1). Although optimal posture is explicitly defined for different postures (i.e., sitting posture) (3), considering the modern working conditions, preserving the optimal posture is challenging (4,5). Essentially, office workers drift away from the optimal posture (6).

Office work is one of the types of occupations where aberrations in optimal posture are observed (4). During the office workday sedentary time increases, characterized by prolonged static posture such as sitting (7,8). Workers spend nearly two-thirds of their average daily working time in sitting (9). During sitting, office workers may adopt a fixed malposture characterized by twisting or bending their back (4,6). Malposture among office workers triggers pathological changes in the musculoskeletal system and causes musculoskeletal disorders (4). More than three-quarters of office workers experience musculoskeletal disorders (4), in various body region (10-12). Challenges that office workers face become a socioeconomic burden as well (13).

The socioeconomic burden of the malposture and its effect on office workers yields the importance and necessity of developing prevention or assessment strategies for malposture. Enhancing postural awareness is one of the approaches pointed out in this scope (14). Postural awareness is defined as the subjective conscious awareness of body posture that is mainly based on proprioceptive feedback from the body periphery to the central nervous system (15). Owing to postural awareness, individuals avoid malposture that is risky for them and prevent the development of more harm (15).

Considering the socioeconomic burden of musculoskeletal disorders in office workers and its high prevalence, the relationship between postural awareness and malposture shows the importance and requirement of the assessment of postural awareness, especially for office workers. Due to this requirement, the adaptation of several postural awareness questionnaires to Turkish was performed related to neck (16) and back (17) anatomic regions considering the asymmetric distribution of prevalence and anatomic localization of the musculoskeletal disorders and their symptoms (i.e., pain) (10-12,15). These adapted questionnaires allow clinicians and researchers an opportunity to assess postural awareness in specific body regions. However, since these questionnaires are specific body region-centered, they do not include comprehensive items on global postural awareness and its subcategories (i.e., effortless postural awareness). These factors reveal the necessity of a scale adapted to Turkish that provides a comprehensive assessment of postural awareness. The Postural Awareness Scale (PAS) developed by Cramer et al. (15) is the scale that is exactly developed in that scope. PAS assesses the individuals' familarity with postural awareness and the efforts of individuals to regulate their postural awareness (15). Although the scale was translated into several languages (18-20), the Turkish cross-cultural adaptation of the scale has yet to be performed. From this point of view, the aim of this study was to perform the cross-cultural adaptation of the PAS and test its reliability and validity among office workers.

METHODS

This study was conducted at Bitlis Eren University between November 2022 and April 2023 and approved by the Ethics Committee of Bitlis Eren University (2022/12-5). Prior to enrollment, participants were verbally informed about the study, and their written consent were obtained. Approval of the author, the original developer of the scale, was also obtained. The sample size was calculated based on the number of items in the PAS. It was reported that 5 to 10 participants should be included for each item, and the total number of participants should be greater than 100 (21). A total of 180 office workers (average age = 39.05 years, standard deviation = 8.44 years) were included in the study. The sociodemographic data of the participants was also recorded.

PAS is a scale that assesses an individual's self-reported body posture awareness (15). PAS consists of two factors: ease/familiarity with posture and

need for attention regulation with postural awareness. Each factor consists of six items. Items scored reversely in need for attention regulation with postural awareness factor are the first, second, third, fourth, fifth, and twelfth items. Items are scored from 1 point to 7 points. One point refers to "not at all true for me", and 7 points refer to "very true for me". The total score of the scale ranges from 12 points to 84 points. Higher scores indicate high postural awareness in the individual. The internal consistency of the PAS is reported to be good (total score α = .80, factor 1 = .81, and factor 2 = .77) (15).

As a first stage of cross-cultural adaptation and validation of the original scale, the original scale was translated from German to Turkish by two independent translators. Forward and backward translations were performed to assure adaptation equivalence. The first draft of the scale was acquired after the translations. The first draft was evaluated by a Turkish language expert. The semantic, idiomatic, experiential, conceptual equivalency, and reading level of the first draft were evaluated by the experts committee, consisting of five physiotherapists with PhD degrees. Revisions were performed until all of the experts agreed on the revised scale. In line with the experts' suggestions, the 1st, 4th, 7th, 11th, and 12th items were revised regarding inverted sentence structure, fluency, and comprehensibility. The final version of the scale was developed after a consensus was reached between the experts.

After the final version of the scale was developed, its reliability was evaluated using the internal consistency analysis test-retest method. In the test-retest method scale was performed on 52 office workers with a two-week interval. Internal consistency is determined as poor, moderate, good, or excellent based on the following internal consistency coefficient values; .5, .5-.75, .75-.90, and higher than .90 (22).

Construct validity of the scale was performed with explanatory and confirmatory factor analyses. Explanatory and confirmatory analyses were performed on 180 office workers. Prior to factor analysis, the Kaiser-Mayer-Olkin (KMO) test was performed, and sample relevance was found to be good (.84) (23). Chi square value of the Bartlett Sphericity test was 970.349 (degrees of freedom = 66; p<.001).

Table 1. Sociodemographic Characteristics of the Participants

		n	%	Test	p
Age (years)	21-30	26	14.4		
	31-40	84	46.7		
	41-50	57	31.7	2.374[a]	.072
	>51	13	7.2		
	Average age (years) =39.05, Standard deviation = 8.44				
Gender	Male	134	74.4	1.235[b]	.218
	Female	46	25.6		
Marital status	Single	41	22.8	.162[b]	.872
	Married	139	77.2		
Educational background	≤Bachelor's degree	53	29.4	1.464[b]	.145
	Postgraduate degree	127	70.6		
Income status	Bad	12	6.7		
	Average	49	27.2	.636[a]	.530
	Good	119	66.1		
Working status	Academic staff	123	68.3	1.347[b]	.180
	Administrative staff	57	31.7		

p<.05 statistical significance, [a] one-way ANOVA test, [b] independent samples t test, Age ranges were determined according to the study of Topino et al. (18).

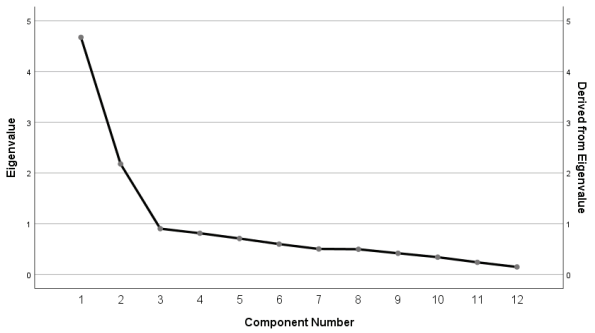

Figure 1. Factor Structure Illustration by Scree Plot Graphic

Statistical analysis

SPSS Amos (IBM, New York, USA) software was used for the confirmatory factor analysis. Explanatory factor analysis was performed by the principal component analysis method to determine PAS's factor structure. In explanatory factor analysis, direct oblimin rotation method was used. Internal consistency and correlation of the scale were assessed with Cronbach's alpha coefficient and Pearson correlation analysis. Kolmogorov-Smirnov test, Skewness, Kurtosis values, and a histogram graphic were used for the assessment of the normal distribution of the scale. Independent sample t test and one-way ANOVA test were used for dual and multiple comparisons. The level of statistical significance was set at p<.05.

RESULTS

Nearly three-quarters of the participants were male, and more than three-quarters of the participants were married. Most of the participants had an associate degree or less. Most of the participants' income was average or good, according to the subjective income classification (24) adapted to the study population and consisting of low, average, good, and very good. The number of academic staff included in the study was two times higher than the number of administrative staff included in the study. There was no statistically significant difference between gender (t = -1.235, p = .218), age (f = 2.374, p = .072), working status (t = -1.347, p = .180) and postural awareness (Table 1). Age range was determined according to the study of Topino et al. (18).

The reliability of the PAS was calculated with internal consistency and test-retest methods. The internal consistency coefficient of the 12 items of the PAS and its factors among the academic and administrative staff working in the university subjected to the research was .834 for the PAS, .886 for factor 1, and .752 for factor 2. Test-retest was performed on 52 office workers with a two-week interval. The reliability coefficient of the test-retest was found to be satisfactory (r = .831). The correlation between each item and the total score was analyzed. In the analysis, the highest correlation was .786 and the lowest correlation was .163. The 12th item had the lowest correlation value (.163).

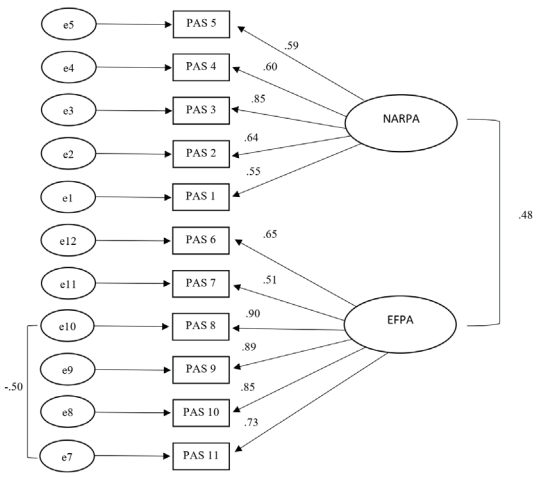

Figure 2. Confirmatory Factor Analysis

Prior to explanatory factor analysis, Kaiser-Mayer-Olkin and Bartlett sphericity tests were performed. The Kaiser-Mayer-Olkin test value was .848, referring to good sample relevance. The chi square value of the Bartlett sphericity test was 970.349±66 (p<.001). Kaiser-Mayer-Olkin and Bartlett Sphericity test results were enough to perform explanatory factor analysis. In explanatory factor analysis, it was observed that the 12th item was loaded on both factors (Table 2). The Scree Plot graphic shows that scale has two factor dimensions (Figure 1). Both factors explain 57.077% of the total variance. The validity of the two-factor dimension and 12 items of the PAS obtained from explanatory factor analysis was analyzed with confirmatory factor analysis. A confirmatory factor analysis was performed for PAS after the explanatory factor analysis. Modifications were performed

Table 2. Explanatory Factor Analysis

		Factor 1	Factor 2
1	Needs to concentrate for being aware of posture		.689
2	Awareness of body posture only by pain		.762
3	Slumps down when sitting		.729
4	Unaware of posture when focused		.657
5	Difficulties to consciously adopt to a posture		.557
6	Often checks posture when working	.739	
7	Influences her/his own appeal by posture	.702	
8	Always aware of sitting or standing posture	.798	
9	Often makes her/himself aware of her/his posture	.864	
10	Aware of posture even when focused	.826	
11	Regulates how she/he feels through posture	.744	
12	Needs to concentrate to feel whether a posture benefits her/him or not	-.375	.553

Factor 1; ease/familiarity with postural awareness, Factor 2; need for attention regulation with postural awareness.

Table 3. Goodness of Fit Indexes of the Confirmatory Factor Analysis

	AGFI	GFI	CFI	NFI	TLI	RMSEA
Recommended range	>.85	>.80	>.90	>.90	>.90	<.08
	.897	.934	.970	.928	.961	.060

AGFI: adjustment goodness of fit index, GFI: goodness of fit statistics, CFI: comparative fit index, RMSEA: root mean square error of approximation, NFI: normal fit index, NNFI, TLI: non-normed fit index

as suggested by the confirmatory factor analysis, and the final model was obtained as illustrated in Figure 2. In the model factor load (regression coefficient) of the 12th item, which falls into the need for attention regulation with postural awareness, it was found to be low (.21). The goodness-of-fit index of the confirmatory analysis was satisfactory (Table 3).

Improvement was observed in the total variance and reliability of PAS after explanatory and confirmatory analyses. The total variance explained rose to 60.13% when the 12th item was removed. Fac-

Table 4. Eleven Item Structure and Factor Load of PAS

		Factor 1	Factor 2
1	Needs to concentrate for being aware of posture		.714
2	Awareness of body posture only by pain		.797
3	Slumps down when sitting		.785
4	Unaware of posture when focused		.675
5	Difficulties to consciously adopt to a posture		.617
6	Often checks posture when working	.730	
7	Influences her/his own appeal by posture	.709	
8	Always aware of sitting or standing posture	.792	
9	Often makes her/himself aware of her/his posture	.870	
10	Aware of posture even when focused	.840	
11	Regulates how she/he feels through posture	.773	

Factor 1; ease/familiarity with postural awareness, Factor 2; need for attention regulation with postural awareness.

tor 1 explains the 42.48%, and factor 2 explains the 17.65% of the variance. In eleven item PAS total score ranges between 11 to 77 points. Average PAS factor scores of the office workers were calculated in this order: 41.54±13.27, 24.76±8.98 (ranging from 6 to 42), and 16.78±6.95 (ranging from 5 to 35) (Table 4).

The reliability and validity of the PAS, consisting of eleven items, were reevaluated after explanatory and confirmatory analyses. Cronbach's alpha coefficient was .854 for all items, .886 for factor 1, and .777 for factor 2. Also, the test-retest score was slightly increased (r = .836).

DISCUSSION

The results of the study revealed that the Turkish version of PAS consists of an 11-item had two-factor structure similar to the original scale developed by Cramer et al. (15) and is a reliable and valid tool to assess postural awareness in office workers. In addition, the results of the study emphasized that sociodemographic parameters (i.e., age and gender) did not affect PAS score.

It is well known that musculoskeletal disorders characterized by chronic pain are seen in office workers, and malposture is regarded as one of the predisposing factors for the development of musculoskeletal disorders in these individuals. Postural awareness of the individual has a definitive role in preventing malposture (15). These facts yield the vital importance of cultural adaptation of a scale to assess postural awareness cumulatively in office workers to develop preventive health measures. PAS is a scale developed in this scope (15).

In the original scale, including 512 participants (92% female, average age = 50.3±11.4) with chronic pain, it was reported that the scale consists of two factors: ease/familiarity with postural awareness and need for attention regulation with postural awareness, and these factors explain 50.80% of the total variance.

An Italian cross-cultural adaptation of the original scale was developed by Topino et al. (20) in a large sample (n = 928, 55% female, mean age = 29.96±11.44) of participants with ages ranging from 18 to 77 years. Like the original scale, Topino et al. (20) found that the scale has two factors: factor 1 explains 27.82% and factor 2 explains 23.18% of the total variance. In total, they report that two factors explain 51% of the total variance. They also report that the scale has good reliability (total PAS = .76, factor 1 = .80, and factor 2 = .79). In the study of Topino et al. (20), 71.55% of the participants were single, almost half of the participants were students; and 44.61% of them had a secondary school degree. The factor load of the 12th item has a low factor load. Similarly, in our study, the factor load of the 12th item was lower.

Another cross-cultural adaptation of the original scale was performed by Colgan et al. (19) in English. They included 301 participants with chronic pain and ages of 18 to 70 years (48% female, mean age = 45±15.5). Similar to the original study (15) and the study of Topino et al. (18) they have found that the scale has good reliability (total PAS = .74, factor 1 = .80, and factor 2 = .81). Similar to the original scale and the study of Topino et al. (20), they found that the scale has two factors, and factor 1 explains 28.82% and factor 2 explains 27% of the total variance. In total, they report that two factors explain 55% of the total variance. Explanatory factor analysis was performed on 150 participants (mean age = 46.59±15.86 years), confirmatory analysis was performed on 151 participants (mean age = 43.70±15.03 years). In the study of Colgan et al. (17) 49% of the participants were married, and 41% of the participants had a high school or lower education degree. In addition, the authors state that the recruitment and data collection processes of the study were performed online due to the COVID-19 pandemic.

The last cross-cultural adaptation of the original scale was performed by Da Costa Silva et al. (18) in French. They included 308 non-clinical adult participants (61.4% female, mean age = 35.22±11.75 years). Similar to the original study (15) and the other cross-cultural adaptation studies (19,20), they have found that the scale has good reliability (total PAS = .70, factor 1 = .82, factor 2 = .77). they discovered, as with the original scale and other studies, that the scale has two factors: factor 1 which explains 26% of the total variance, and factor 2 which explains 12% of the total variance. In total, they report that two factors explain 42% of the total variance. Explanatory factor analysis was

performed on 154 participants (62% female, mean age = 36±12 years), confirmatory analysis was performed on 154 participants (60% female, mean age = 35±12 years). In addition, the authors state that the recruitment and data collection processes for the study were performed online.

In line with the previously reported Turkish version of the PAS, had two factors. The factor load ranged from .553 to .864. However, it was observed that the 12th item of the PAS loading on both factors had a low factor load (.21) in the confirmatory factor analysis. The goodness of fit index values of the confirmatory factor analysis were in an acceptable range (x2 / df = 1.636, AGFI = .897, GFI = .934, CFI = .970, NFI=.928, TLI = .961, RMSEA = .60). It is expected to have a higher correlation between the item scores on the scale and the total score of the scale. It is suggested that the scores of the items should be correlated with the total score of the scale, and correlation values should be higher than .30 (25). Except for the 12th item (r = .163) of the scale, all items had a correlation higher than the minimum acceptable value. The 12th item was removed from the Turkish version of the scale due to breaking the construct validity, which was confirmed by the explanatory and confirmatory factor analyses. The factor load of the final version of the scale ranged from .617 to .870. Thus, the construct validity of the Turkish version of the 11-item PAS was provided.

Although our study differs from the previous studies according to demographic characteristics (i.e., age and gender) and study population, we have achieved similar reliability and validity results. This leads to speculation that these factors may not affect postural awareness. This speculation is confirmed in the study by Topino et al. (20) pointing out that gender and age are not correlated with postural awareness. According to the results of the independent sample t test and one-way ANOVA test, we have concluded the same result for gender (t = 1.235, p = .486) and age (f = 2.374, p = .072) as well. Postural awareness is fundamental for postural control (26), and it is reported to be stable between the ages of 30 and 60 years (27). Because the average age of our participants was in the reference range, age may not affected the PAS score of the participants, as in the study by Topino et al .(20). Although our study was performed in a different population, we reached the same results as the original study, which was performed in individuals with chronic pain. This might be caused by the fact that office workers have a high prevalence of musculoskeletal disorders characterized by chronic pain (28). Calik et al. (29) and Ardahan et al. (30) report that office workers in Turkey have a high incidence of upper back, neck, and lower back pain. Apart from these differences, there was no significant difference between working status and postural awareness. The same working hours and occupational environment might result in this non-significant correlation between working status and postural awareness. Another matter that should be pointed out is the data collection method. Da Costa Silva et al. (18) and Colgan et al. (19) report conducting the study online. In our study, we conducted face-to-face interviews with the participants. However, we have reached the same conclusion as Da Costa Silva et al. (18) and Colgan et al. (19). From this point of view, each method can be used in further studies.

Apart from our study, different Turkish cultural adaptations were performed (16,17) due to the high prevalence of neck and back pain in the society (31,32). In these studies, cultural adaptations of the Fremantle Neck Awareness Questionnaire and the Fremantle Back Awareness Questionnaire are performed by Onan et al. (16) and Erol et al. (17) on patients with chronic neck and back pain. In both studies the reliability and validity of the questionnaire are reported to be good, as Cronbach alpha scores for neck and back awareness are in order by 0.70 (16) and 0.87 (17). In these studies, postural awareness assessment is focused on specific body regions (16,17) because neck and back pain are commonly observed in the population (31,32). In addition, because of the mentioned culturally adapted questionnaires' aim, these questionnaires have only one factor. For this reason, they do not primarily focus on giving clinicians or researchers information about the individual's effortless postural awareness or need for attention regulation with postural awareness, which are the factors of PAS (15). Turkish version of PAS developed in this study by having two factors, and its global postural awareness assessment capability makes it easy to

be implanted in clinical and research settings for the postural awareness assessment in office workers. By the cultural adaptation of PAS, clinicians and researchers are going to have another option to assess postural awareness in office workers in addition to other culturally adapted questionnaires. Clinicians will have an opportunity to assess global postural awareness and compare it with regional postural awareness by the previously culturally adapted questionnaires, and this will aid in developing much more efficient treatment strategies in clinical settings.

In conclusion, the Turkish version of the PAS is a reliable and valid tool for assessing postural awareness in office workers. Turkish version of the PAS can be used for the global postural assessment of office workers and postural awareness subcategories without requiring any equipment.

The study has several limitations. Firstly, additional instrumental methods for the postural assessment were not used in the study. Secondly, chronic pain and its severity was not assessed in participants.

Despite the limitations, this study showed that the Turkish version of the PAS is a reliable and valid non-instrumental assessment method for the postural awareness assessment of office workers. The use of the Turkish version of the PAS on office workers and other individuals in a high-risk group might be beneficial for public health. Determination of adults' postural awareness might contribute to health education planning.

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Authors' contributions: Ö.D.: Conceptualization, Design, Methodology, Resources, Supervision, Formal Analysis, Review & Editing C.Ö.: Conceptualization, Design, Methodology, Investigation, Resources, Statistical Analysis, Writing-Original Draft

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