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Published online: 07 Feb 2017.

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ASSESSMENT PROCEDURES

Translation, cultural adaptation, reliability, and validity of the Turkish version of the Penn Shoulder Score

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ABSTRACT

Purpose: The purpose of this study is to translate the Penn Shoulder Score into Turkish and to establish its cultural adaptation, reliability, and validity in patients with shoulder dysfunctions.

Methods: The Penn Shoulder Score was translated and culturally adapted from English into Turkish. Subsequently, the Penn Shoulder Score, the Constant Score, the American Shoulder and Elbow Score, and the Western Ontario Rotator Cuff Index were completed by 97 patients with shoulder dysfunctions. To determine the test–retest reliability, 30 patients completed the Penn Shoulder Score again on day 3. Intraclass correlation coefficient and Cronbach alpha were calculated to assess reliability. The validity of the questionnaire was assessed in terms of convergent validity with Pearson Correlation Coefficient using the Constant Score, the American Shoulder and Elbow Score, and the Western Ontario Rotator Cuff Index.

Results: Internal consistency was good, with a Cronbach alpha of 0.81. The Intraclass correlation coefficient was 0.90 (95% confidence interval: 0.78, 0.90), demonstrating good test–retest reliability. Pearson correlation coefficients of the Penn Shoulder Score in relation with the Constant Score, the American Shoulder and Elbow Score, and the Western Ontario Rotator Cuff Index were 0.65, 0.78, and −0.77, respectively.

Conclusion: The Turkish version of the Penn Shoulder Score is a reliable and valid measure for assessing patients with shoulder dysfunctions.

➤ **IMPLICATIONS FOR REHABILITATION**

- The Turkish version of the Penn shoulder score is valid and reliable outcome measure for assessing patients with shoulder dysfunctions.
- The Turkish version of the Penn shoulder score could be easily performed by patients and it is easy to score by clinicians. It is recommended to use in clinical settings and in research.

Introduction

Shoulder disabilities are the most frequently observed musculo-skeletal disability type following spinal cord and knee problems [1]. By causing pain and decreasing joint mobility, shoulder disabilities negatively affect the patient's functional levels, occupational activities, and quality of life [2]. The main objective of the treatment in such patients is the improvement of the patient's life quality by means of controlling the pain and accomplishing a pain-free function. In evaluating patients with shoulder pain, patients' own statements regarding their pain status are taken as the basis [3]. For patients with shoulder disabilities, a variety of scales are utilized including the University of California Los Angeles Shoulder Rating Scale [4], the American Shoulder and Elbow Surgeons Evaluation Form (ASES) [5], the Disabilities of the Arm, Shoulder and Hand Scale (DASH) [6], the Constant Score [7], the Shoulder Pain and Disability Index (SPADI) [8], the Simple Shoulder Test [9], the Oxford Shoulder Score [10], the Western Ontario Shoulder Tools [the Western Ontario Shoulder Instability Index (WOSI), the Western Ontario Osteoarthritis of the Shoulder Index (WOOS), and the Western Ontario Rotator Cuff Index (WORC)] [11–13], and the Penn Shoulder Score (PSS) [14].

PSS was developed by Leggin et al. to evaluate shoulder dysfunctions in1999. The PSS is a comprehensive outcome measure that assesses pain, patient satisfaction, and function [14]. Therefore, the increasing number of scales associated with shoulder dysfunction would provide a broader perspective for clinicians and researchers. However, there is no gold standard for assessing shoulder dysfunction. ASES, DASH, SPADI, and Constant score are valid, reliable, and widely used scales for shoulder dysfunctions. When compared with these scales, PSS presents certain advantages. DASH scale is too detailed and its completion takes too much time. In addition, in both DASH and SPADI scale, discrepancies have been spotted between the statements of the patients and the points they marked in visual analog scale-type questions, which deteriorates their objectivity. The ASES and the Constant Score are not of self-report type, and involve sections filled out by the patient and the clinician. However, as PSS is filled out only by the patient and the calculation is performed by the clinician, it takes less time to complete. Besides, while WOSI, WOOS, and WORC are disability-specific, PSS can be used in many shoulder pathologies [15]. Previous studies also investigate specific attributes of the PSS. Cook et al. [16] assessed the error associated with the function subscale and compared it to other shoulder scales at differing levels of function. They

found that the PSS had much better precision throught all score ranges than the ASES and SPADI. Michener et al. [17] demonstrated convergent construct validity of the ASES score by reporting correlation with the PSS of 0.78. However, there is only Brazilian version [18] of this scale and there is no Turkish version available. To be used internationally, these questionnaires must be translated into the respective local languages and must also be culturally adapted. The cross-cultural adaptation process is required when an instrument is used in a different language, setting and time to reduce the risk of introducing bias into a study [19,20]. The aim of this study was to translate and culturally adapt the original English version of the PSS into Turkish version and to assess the validity and reliability of this instrument in patients with shoulder dysfunctions.

Methods

Permission has been received before the study from the author who developed the original scale. The study was approved by the Local Ethics Commission (date: 18 June 2015, reference number: 77082166–604.01.02).

Translation and cultural adaptation

The translation and the cultural adaptation of the scale were completed considering the stages indicated by Beaton et al. [21]. It was translated from its original English version into Turkish by two native Turkish speakers (one of them was a physiotherapist and aware of study, the other one was an English linguistic scientist, but unaware of the concepts). Both translators were fully competent in both languages. The translators combined the two Turkish translations into one single translation. The Turkish version of the translation was translated back to English by two independent professional bilingual translators. A committee consisting of four translators and one Turkish linguist gave the translation its final shape by comparing the last and the first translation. No issues involving the translation or cultural adaptation were experienced. However, in the original scale, "Libra" (pound) was used as weight unit in questions 12, 13, 15, and 16. Since kilogram is used as the weight unit in Turkey, "Libra" was converted to kilograms by the committee. Face validity of the pre-final Turkish version was tested on 30 volunteers – 15 patients with shoulder dysfunction and 15 healthy individuals. After testing pre-final Turkish version no changes were needed, the pre–final version was adopted as the final version of the PSS (Appendix).

Subjects

The study was conducted with 104 patients with shoulder problems who were admitted to the Department of Physiotherapy and Rehabilitation for treatment and agreed to participate in the study. Seven patients were later excluded from the study as they
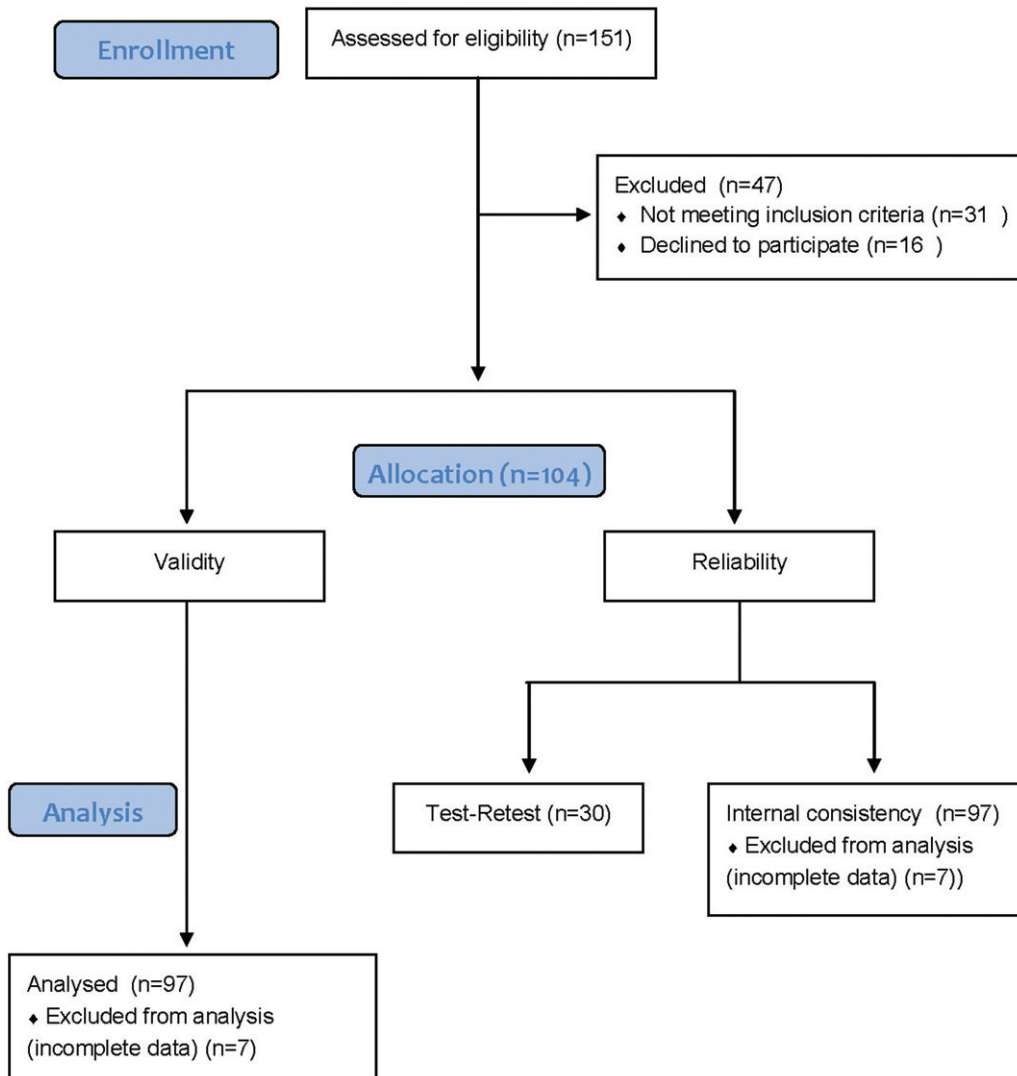

Figure 1. Flow diagram of the patients.

did not fully complete the survey (Figure 1). The inclusion criteria were as follows: (1) being 18 years of age or older, (2) being diagnosed with shoulder dysfunctions, (3) being literate in Turkish, and (4) receiving no treatment between test–retest assessments. The exclusion criteria were as follows: (1) inability to complete the form due to cognitive impairment, (2) patients with neurological diseases and systemic inflammatory conditions, and (3) dysfunctions in other structures of the upper limb. The PSS has also been used as an outcome measure in both operated and non-operated patients [14,18]. In order to make homogeneous group patients with history of shoulder surgery were excluded. All the patients were administered the PSS-T, the Constant Score, the ASES, and the WORC. In order to determine the test–retest reliability, 30 patients were given the PSS-T once more on day 3.

Self-report measures

The Penn Shoulder Score

The PSS is a 24-question survey that measures "pain", "satisfaction", and "function". In the survey, pain (three questions) and satisfaction (one question) are measured through a 10-point visual analog scale. For pain, 0 means "no pain" and 10 means "worst pain possible"; whereas for satisfaction, 0 means "not satisfied" and 10 means "very satisfied". "Function" was measured by a 4-point Likert scale between 0 and 3. In the subscale, 0 means "can't do at all" and 3 means "no difficulty". Besides, there is also the option "did not do before injury" in the function subscale. For scoring purposes, the total possible points for the function subscale are reduced by 3 when this option is marked. Scoring is based on a percentage of the total possible points. Total PSS scores range between 0 and 100. Higher scores show higher satisfaction and better function. Potential benefits of the PSS are that it includes items that address patient satisfaction and that cross a spectrum of contexts for pain and function [14].

The Constant Score

The Constant Score consists of subjective and objective evaluations. In subjective evaluations, "pain" is 15 points and "activities of daily living" are 20 points. In objective evaluations, "range of motion" is 40 and "shoulder power" is 25 points. The maximum score a patient can get is 100. Total point scoring is as follows: 80–100: excellent, 65–79: good, 51–64: moderate, and 0–50: bad [7,22].

The American Shoulder and Elbow Score (ASES)

The ASES consists of two sections evaluated by the clinician and the patient. The self-assessment section evaluates both pain (50 points) and function (50 points). The completion of the scale takes about 5 min. Pain is evaluated through a 0–10 visual analog scale. Function questions focus on the patient's ability to perform life activities for 10 days. Function is evaluated through a 4-point Likert scale ranging from 0 (cannot do it) to 3 (not difficult) [5,15].

The Western Ontario Rotator Cuff Index (WORC)

WORC measures the life quality in patients with rotator cuff disorder. It consists of pain and physical symptoms (six questions), sports and recreation (four questions), work (four questions), lifestyle (four questions), and emotions (three questions). Questions are answered on a 100 mm visual analog scale. The best score is 0 and it means the patient experiences no reduction in his/her life quality due to the shoulder disability, whereas the worst score is 2100, which means the patient experiences a serious reduction in his/her life quality due to the disability [13,23].

Statistical analysis

Statistical Package for the Social Sciences (SPSS 22.0, SPSS Inc., Chicago, IL) was utilized to carry out the statistical analyses. The reliability of the PSS was evaluated through test–retest and internal consistency methods and the validity of the scale was tested via the analysis of the construct validity. Test–retest reliability was estimated using the Intraclass Correlation Coefficient (ICC) score while the Cronbach alpha value was computed as an estimate of the internal consistency. As for the test–retest reliability, the ICC score of 0.75 and above [24] and the Cronbach alpha value of 0.80 and above was considered appropriate [25,26]. With respect to the construct validity, convergent validity was tested. For the convergent validity of the scale, the PSS-T total score and its subscales were correlated by Pearson's correlation coefficient with the total scores of the Constant Score, ASES, and WORC, and related subscales. Pearson correlation values in the range of 0.81–1.00, 0.61–0.80, 0.41–0.60, 0.21–0.40, and 0–0.20 were considered excellent, very good, good, weak, and bad, respectively [27].

Results

Demographics of the participants and their clinical characteristics are presented in Table 1. Translation and cultural adaptation process was completed in alignment with the above mentioned procedure and no problems were encountered at this stage. In the original version of the PSS, "Libra" was used as weight unit in 12, 13, 15, and 16 questions. However, kilogram is used as the weight unit in Turkey, so "Libra" was converted to kilograms by the committee. The results of the internal consistency of the PSS revealed the Cronbach alpha level as 0.81. This value indicated that PSS-T had a high level of internal consistency. The test–retest ICC scores of the PSS-T were found as 0.83 for the "pain" subscale, 0.78 for the "satisfaction" subscale, and 0.90 for the "physical" subscale of the questionnaire. The total ICC score of the questionnaire was found as 0.90 (Table 2). When all the ICC values were analyzed,

Table 1. Demographic specifications and clinics of subjects.

	$n = 97$
Age (year)	52.8 ± 13.4
	n (%)
Gender	
Male	41 (42.3)
Female	56 (57.7)
Affected shoulder	
Dominant	63 (64.9)
Non-dominant	34 (35.1)
Employment status	
Employed	34 (35.1)
Employed but work suspended	3 (3.1)
Not employed (house wife)	41 (42)
Retired	19 (19.6)
Time since injury (month)	
<1	3 (3.1)
1–3	14 (14.4)
3–6	29 (30)
6–12	24 (24.7)
>12	27 (27.8)
Education	
Literate	3 (3.1)
Primary school	32 (33)
Secondary school	10 (10.3)
High school	30 (30.9)
University	22 (22.7)
Shoulder disorders	
Impingement	24 (25)
Rotator cuff tear	45 (46)
Shoulder instability	11 (11)
Other	17 (18)

Table 2. Test–retest reliability of the Penn Shoulder Score – Turkish and its subscales.

Subscale	ICC
PSS pain	0.83
PSS satisfaction	0.78
PSS function	0.90
PSS total score	0.90

PSS: Penn Shoulder Score; ICC: Intraclass Correlation Coefficient.

Table 3. Correlations among the Penn Shoulder Score – Turkish and other outcome measures.

	PSS pain	PSS satisfaction	PSS function	PSS total
Constant Score total	−0.41	0.53	0.66	0.65
Constant Score pain	−0.54	…	…	…
ASES total	−0.67	0.61	0.71	0.78
ASES pain	0.63	…	…	−0.53
ASES function	…	…	0.83	0.79
WORC total	0.59	−0.66	−0.71	−0.77
WORC work	…	−0.60	−0.77	−0.77
WORC lifestyle	…	−0.58	−0.64	−0.67
WORC sports/recreation	…	−0.56	−0.62	−0.67
WORC physical symptoms	0.55	…	…	−0.58
WORC emotions	…	−0.44	…	−0.48

PSS: Penn Shoulder Score; ASES: American Shoulder and Elbow Society; WORC: Western Ontario Rotator Cuff Index.

the questionnaire was found to have high test–retest reliability. The total score of the questionnaire was showed to have a high correlation with the total scores of the Constant Score ($r = 0.65$), the ASES ($r = 0.78$), and the WORC ($r = −0.77$). Also for gender differences, the construct validity of the PSS was analyzed and similar results were recorded. Pearson correlation coefficient value was calculated as for female: Constant Score: 0.59, ASES: 0.75, WORC: −0.65, and for male: Constant Score: 0.63, ASES: 0.78, WORC: −0.82. Besides, the correlation of the PSS-T subscales with the subscales and the total points of the other questionnaires were also analyzed. The PSS-T "pain" subscale was not found to have a matching subscale in the WORC. The PSS-T and the Constant Score "pain" parameters were found to have a good correlation (−0.54). In the PSS-T and the ASES, the "pain" subscale revealed a very good (0.63), and the "function" subscale revealed an excellent (0.83) correlation. The PSS-T "satisfaction" subscale was not found to have a matching subscale in the ASES, the Constant Score, and the WORC. Considering that the "satisfaction" subscale was related to the overall status of the patient, it was found viable to check its correlation with the Constant Score, the ASES, and the WORC total scores. The PSS-T "satisfaction" subscale was found to have a good correlation with the total score of the Constant Score (0.53), and a very good correlation with the total scores of the ASES and WORC, 0.61 and 0.66, respectively. The PSS-T subscales and WORC subscales were also analyzed. The PSS-T "pain" (between 0.55 and 0.59) and "satisfaction" (between −0.44 and −0.60) subscales were observed to have a good correlation with the WORC subscales. The PSS-T "function" subscale was found to have a very good correlation with the selected subscales of the WORC (between −0.62 and −0.77) (Table 3). When all these values are analyzed, it is seen that the PSS-T has sufficient construct validity.

Discussion

In the literature, it can be observed that there are many shoulder outcome measure scales and some of them have reliable and valid Turkish versions [15,22,23,28–32]. There is no single universally accepted scale as each scale has its own advantages and disadvantages [33]. We hold the belief that PSS, which was developed by Leggin et al. [14] in 2006, has started to gain widespread popularity in recent publications, where more popular scales can be found.

With this study, it was determined that PSS-T is compatible with the Turkish language, and it is reliable and valid. In finding out about the validity of the scale, Constant Score, ASES, and WORC scales, all of which were proven to have reliable and valid Turkish versions, were used [15,22,23]. Leggin et al. [14], developers of the original version, found a Cronbach alpha value of 0.93 for internal consistency, and De Souza et al. [18] stated it as 0.92 for Brazilian version. Cronbach alpha value of PSS-T was found as 0.81. PSS-T internal consistency value shows similarity with the original and Brazilian versions. This result indicates that PSS-T has high internal consistency.

Test–retest duration for PSS original version was 72 h; and in Brazilian version, it was set to 2–7 d. Taking the original version

and Marx et al.'s study [34] into consideration, test–retest duration was set to 72 h in this study. In PSS original version, test–retest ICC value was determined as 0.94 for the entire scale (subscales: pain: 0.88, satisfaction: 0.93, and function: 0.93) [14]. Brazilian version test–retest ICC value for the entire scale was 0.92 (subscales: pain: 0.85, satisfaction: 0.64, function: 0.94) [18]. In PSS-T, test–retest ICC value was determined as 0.90 for the entire scale (subscales: pain: 0.83, satisfaction: 0.78, and function: 0.90) [14]. These results show that PSS-T has high test–retest reliability.

In this study, PSS-T was shown to have a very good correlation with Constant Score (0.65), ASES (0.78), and WORC (−0.77). As far as these values are considered, statistical significance levels of all PSS scales seem to show similarities.

PSS-T and Constant Score and ASES "pain" parameters were found to have a good correlation (−0.54) and very good correlation, respectively, (0.63). Despite the presence of items evaluating pain, there is no "pain" subscale in WORC scale, and, therefore, the correlation between WORC scale and PSS-T could not be checked for pain subscale. Evaluation of pain is a significant parameter in outcome measure scales. While pain is evaluated with three items in PSS, it is evaluated with one item in Constant and ASES and two items in WORC. In evaluating pain, a visual analog scale was utilized in ASES and WORC, and a 4-point Likert scale was used in Constant Score [15,22,23]. In PSS pain subscale, although, the intensity of pain is determined with three separate numeric rating scales for three different activity levels. It has been revealed that numeric rating scale is the most reliable method both for literate and illiterate people [35]. We hold the belief that PSS pain subscale is superior to other scales both in terms of number of items and method of evaluation.

PSS-T "satisfaction" subscale was not found to have a one-to-one counterpart in ASES, Constant Score, and WORC questionnaires [15,22,23]. When we analyzed other scales that had valid Turkish versions, it was observed that they involved no item or items evaluating satisfaction [28–31]. When we look at the literature, although, it can be observed that there is one item evaluating satisfaction in shoulder rating scale by the University of California Los Angeles (UCLA) [36]. While the evaluation in UCLA was done by the patient by stating whether s/he is satisfied or not, satisfaction is determined by a numeric rating scale in PSS. From this aspect, we believe that PSS might proven to be a strong alternative to other shoulder outcome measure scales with validity and reliability proven Turkish versions.

PSS-T "function" sub-parameter revealed an excellent (0.83) correlation with ASES questionnaire. Almost all shoulder outcome measure scales have items evaluating function. About 60% of PSS total score consists of function sub-parameter. This ratio is 50% in ASES and 20% in Constant Score. Function is evaluated through a 4-point Likert scale in PSS, and the activities that the individuals

never actually do or have never tried are excluded from evaluation and not scored. This scoring system, we believe, eliminates both sociocultural and gender-related differences, and thus yield more objective results.

A limitation of our study was the untested responsiveness of PSS-T. Responsiveness is the other important psychometric considerations for clinical outcome measures. As a future study responsiveness of the PSS-T should be analyzed. Besides, for ensuring the subscales of the PSS-T, factorial analysis should be calculated. Further study can be done reliability and validity of the Turkish version of the PSS in patients undergoing shoulder surgery.

Conclusion

It was found that the Turkish version of the PSS has a good internal consistency, reliability, and construct validity. Therefore, the Turkish PSS is recommended as an outcome measure for assessing patients with shoulder dysfunctions.

Disclosure statement

The authors report no declarations of interest.

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Appendix

Bölüm A

Penn Omuz Skoru, Bölüm 1: Ağrı ve Memnuniyet

Lütfen ağrı veya memnuniyet seviyenize en yakın sayıyı daire içine alın.
Kol gövde yanındayken dinlenme pozisyonunda ağrı: _____
   0 1 2 3 4 5 6 7 8 9 10
Ağrı yok   en kötü ağrı

Normal aktivitelerde ağrı (yemek yeme, giyinme, yıkanma):
   0 1 2 3 4 5 6 7 8 9 10   _____
Ağrı yok   en kötü ağrı

Ağır aktivitelerde ağrı (uzanma, kaldırma, çekme, itme, fırlatma):
   0 1 2 3 4 5 6 7 8 9 10   _____
Ağrı yok   en kötü ağrı

Ağrı skoru: = _____/30

Omuzunuzun şu anki iş yapabilme durumu sizi ne kadar memnun ediyor?
   0 1 2 3 4 5 6 7 8 9 10   _____/10
Memnun değilim   çok memnunum

Penn Omuz Skoru: Fonksiyon

Aktiviteleri yaparken yaşadığınız zorluğu anlatan numarayı daire içine alın.	zorluk yok	biraz zor	çok zor	yapamıyorum	daha önce yapmadım
1. Tişörtünüzü içine sokmak için elinizi bele götürme	3	2	1	0	X
2. Belin ortasını yıkamak/sütyen kopçası açmak	3	2	1	0	X
3. Tuvalet aktivitelerinde	3	2	1	0	X
4. Diğer omuzun arkasını yıkamak	3	2	1	0	X
5. Saç taramak	3	2	1	0	X
6. Dirseğinizi başınızdan uzak tutarak elinizi başa götürmek	3	2	1	0	X
7. Kendi başına giyinmek (özellikle mont giyme ve t-shirt çıkarma)	3	2	1	0	X
8. Etkilenen kol üzerine yatmak	3	2	1	0	X
9. Etkilenen kol ile kapı açmak	3	2	1	0	X
10. Etkilenen kol ile marketten poşet taşımak	3	2	1	0	X
11. Etkilenen kol ile valiz/evrak çantası taşımak	3	2	1	0	X
12. Dirsek düzken omuz seviyesinde 0.5–1 kg ağırlık kaldırmak	3	2	1	0	X
13. Dirsek düzken omuz seviyesinde 3.5–4,5 kg ağırlık kaldırmak	3	2	1	0	X
14. Dirsek düzken baş üzerinde Rafa uzanmak	3	2	1	0	X
15. Dirsek düzken baş üzeri 0.5–1 kg ağırlık kaldırmak	3	2	1	0	X
16. Dirsek düzken baş üzeri 3.5–4,5 kg ağırlık kaldırmak	3	2	1	0	X
17. Günlük spor/hobi aktivitelerinde	3	2	1	0	X
18. Günlük ev işlerinde (temizlik, çamaşır, yemek yapma)	3	2	1	0	X
19. Fırlatma/yüzme/Baş üstü raket sporları	3	2	1	0	X
20. İşinizde tüm gün çalışmak	3	2	1	0	X

SKORLAMA
Toplam kolon= _____ (a)
(X) sayısı × 3= _____(b), 60 - _____(b)= _____(c) (eğer X yoksa fonksiyonel skor = toplam kolon)
Fonksiyonel skor= _____(a) ÷ _____(c)= _____ × 60 _____/60