

# Disablement in the physically active scale-TR short form-10: Turkish adaptation study

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## ABSTRACT

**Introduction:** The absence of a scale adapted to Turkish to determine the level of insufficiency in the physical activities of athletes sometimes causes difficulties in our clinical practices. Our study aims to adapt the Short Form-10 (SF-10) of the Disablement in the Physically Active Scale (DPA) to Turkish.

**Materials and Methods:** Athletes who are healthy or have any musculoskeletal injuries participated in the study. DPA-TR SF-10, which consists of ten items, and the SF-12 scale used in the analysis of concurrent validity were applied to 106 athletes.

**Results:** As a result of confirmatory factor analysis (CFA), no item was required to be removed from the scale. A high level of correlation was found between DPA-TR SF-10 and physical component summary sub-score of the SF-12 scale ( $r = 0.61$ ;  $p < 0.01$ ). The reliability coefficient obtained as a result of the reliability analysis was estimated to be 0.91. All items in the scale were determined to be distinctive. In order to facilitate the calculation of the DPA-TR SF-10 score, the sum of the answers given to the 5-point Likert Scale was evaluated. Thus, the lowest score of the DPA-TR SF-10 is 10, and 50 is the highest score.

**Conclusion:** DPA-TR SF-10 has been provided in Turkish to evaluate physically active individuals/athletes as a valid and reliable measurement tool.

**Key Words:** Disablement, evaluation, physical activity, scale adaptation

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## INTRODUCTION

Physical activity-related musculoskeletal injuries may cause loss of joint range of motion, loss of muscle strength, poor postural control, joint laxity and kinesiophobia in the short term, and in the long term, their effects may be the triggering of the development of early post-traumatic osteoarthritis and decrease in health-related quality of life (Gabriel et al. 2019). In accordance with evidence-based medical practice, data on the clinical status and patient outcomes must be objective (Snyder et al. 2008). Therefore, the difference in the level of affection of two different

patients with the same severity of injury is being tried to be examined through various scales and tests (Snyder et al. 2008). In light of the data obtained from objective evaluation methods, it is an ideal approach to determine and meet the personal health needs of the patient (Snyder et al. 2008). To explain this statement with an example, we can evaluate the situations of a sedentary individual and athlete who experience an ankle sprain. As the expectation of a sedentary individual regarding recovering from an ankle sprain would be able to walk comfortably, the expectation of

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a professional football player would be able to run and demonstrate his football skills (Vela and Denegar 2010b). While the perceived level of personal health increases when we can provide the ability to walk comfortably to the sedentary individual, it will not be enough for the football player when provided with the same level.

If the injured person is physically active, a different level of feeling of inadequacy will develop, and that person's quality of life may be affected differently from the sedentary individual. Because activity level of the people also affects their expectations of functionality. It is also necessary to consider the physical, social and environmental factors of individuals. Particularly, after athletes with a professional level of participation in physical activity experienced an injury, they may suffer economic losses, have different concerns about their careers and be subjected to in-team conflicts (Vela and Denegar 2010b). From this point of view, scales to evaluate the overall functionality rather than injury-specific or body part-specific scales were needed (Snyder *et al.* 2008; Vela and Denegar 2010a).

Although this emerging need has been tried to be met using valid and reliable scales for evaluating both physical and mental health, it has been observed that the scales that do not take into account the level of physical activity are not sufficient to evaluate the physical and mental functionality of athletes (Baker *et al.* 2019; Vela and Denegar 2010a). Due to this, a new scale to assess the insufficiencies of the physically active population was developed (Houston *et al.* 2015; Vela and Denegar 2010b). The fact that 'The Disablement in the Physically Active Scale' is frequently preferred by researchers to evaluate the physical and mental state of the physically active population and can be used successfully inpatient follow-up (Brody *et al.* 2017; Hoch *et al.* 2015; Houston *et al.* 2014; Houston *et al.* 2015; Houston *et al.* 2015) encouraged the development of two different short forms (SFs) of this scale with 8 and 10 questions, respectively (Baker *et al.* 2019).

The absence of a scale adapted to Turkish to determine the level of insufficiency in the physical activities of athletes sometimes causes difficulties in our clinical practices.

This study aims to adapt the SF-10 of the Disablement in the Physically Active Scale (DPA) to Turkish.

## MATERIALS AND METHODS

The study was determined as a scale adaptation study in a quantitative research design. Russell Baker, the scale developer (2019), was contacted through email on 8 March 2019, and his permission was obtained. Later, the research protocol was approved with decision number 123 of the Local Ethics Committee.

In this section, information about the study group, data collection tools, the translation of the scale into Turkish and the statistical analysis carried out in the estimation of the psychometric properties of the scale was given.

### Study group

Volunteers that meet the criteria of inclusion and exclusion in the original study participated in the research (Baker *et al.* 2019). Accordingly (Baker *et al.* 2019), at least 30 min a day and 2 days a week physical activity, being healthy or being in the first 72 h after any musculoskeletal injury (acute injury) or in between the 3<sup>rd</sup> day and the 1<sup>st</sup> month after any musculoskeletal injury (subacute injury) or having musculoskeletal system injury/pain that has been going on for at least 1 month and this disorder causing complaints and the disappearance/decrease of these complaints with routine (conventional) treatment or non-narcotic pain medication (persistent injury) are used as participation criteria to the research.

Participants who are physically inactive and those whose complaints/pain do not disappear/decrease with routine (conventional) treatment or non-narcotic pain medication (chronic injury) are excluded from the study.

Physical activity levels of athletes were determined as (Baker *et al.* 2019) Competitive athletes: 'I get pre-sport/sporting license checkup at least once a year. I have a planned training program. I have a trainer that participates in and/or organises my training program. I participate in sports competitions'. Recreational athlete: 'I meet the physical activity criteria and participate in sports. But I do not participate in sports competitions'. Physically active individual: 'I am physically active in daily life activities. I do not meet the criteria of competitive and recreational-level athletes. But I am defined as someone who is physically active in daily activities (for example, I am physically active for at least 30 minutes a day and three days a week)' (Baker *et al.* 2019).

### Data collection tools

#### *Disablement in the Physically Active Scale Short-Form 10*

DPA, which was developed by Vela and Denegar (2010b), was adopted by Baker *et al.* in order to be (2019) introduced as a SF. DPA SF-10 consists of 10 questions, and the scale has three sub-dimensions. The scale is answered through a 5-point Likert scale. There are no negative questions on the scale. Scores of the sub-dimensions of the scale are found by subtracting 3 points for the sub-dimensions of 'Impairment Summary Component' and 'Functional Limitations Summary Component', and 4 points for 'Quality of Life Summary Component'. The sum of the sub-dimension scores gives the total score. The lowest score of the scale is 0 and the highest score is 40.

#### *Short Form-12 Health Survey*

Health-related quality of life means the function and well-being of life's physical, mental and social dimensions. SF-36 and the SF-12 are among the most used multi-item health-related quality of life scales. These scales were developed by Ware *et al.* and Ware and Gandek (1996; 1994) in order to evaluate the quality of life, and it is a scale that reviews the quality of life in the last 4 weeks.

SF-36 consists of thirty-six items and provides measurements in eight dimensions. These dimensions are physical function

(10 items), role restriction due to physical problems (4 items), pain (2 items), social function (2 items), mental health (5 items), role restriction due to emotional state (3 items), energy (4 item) and general health condition (5 items). Evaluation is made using the Likert type, except for some items. Sub-scales measure health between 0 and 100, and 0 indicates poor health, while 100 indicates good health. The validity and reliability analysis of the Turkish version was made by Koçyiğit *et al.* (1999).

SF-12, which is an even shortened version of SF-36 and consists of 12 questions, is made up of the eight sub-dimensions in SF-36, but there is no total scale score. In SF-12, scoring is made under two sub-titles, namely physical component summary (PCS) and mental component summary (MCS) scores. T-score, which is used while the SF-36 score is being calculated, is not used with the SF-12. Instead, the SF-12 uses a different scoring rule, and it is not possible to calculate the result if there is missing data. The increase in the score indicates the goodness, and the decrease indicates the limitedness (Farivar *et al.* 2007).

#### Procedure

In this study, DPA-TR SF-10 was used for data collection, and SF-12 was used to analyse the concurrent validity of the study. The data were collected from healthy athletes during their training and from the athletes with injuries who are in their treatment process, with face-to-face interview techniques. The questions were read to individuals by the researcher himself/herself, and the answers were marked on the scale by the researcher. The questionnaires were filled by each individual in an average of 30 min. An additional period was provided to participants to ask questions and share their opinions about the subject.

After obtaining the necessary permissions from Baker for the adaptation of DPA-TR SF-10, the scale items were translated by the experts of the subject area from the English original into Turkish. During the translation process, importance has been given to ensure that the items are compatible with the original and also understandable in our society.

When the translation process was completed, the translations of the items were brought together to see the commonalities between them, differences between the texts were taken into account, and after a 4-hour session, the first draft of the Turkish form became ready.

The preliminary trial of the first draft of the Turkish form of the scale was conducted with 20 athletes who applied to Sports Medicine polyclinic in order to test its language and comprehensibility and to determine whether the items are suitable to the living culture of the individuals in Turkey. In line with the feedback, the scale was made ready for implementation after final adjustments [Appendix 1].

In the estimation of the psychometric properties of the scale, descriptive analysis of the population and the scale, exploratory and CFA for the construct validity, scale compatibility analysis

for the concurrent validity, Cronbach's alpha and generalizability theory (G-theory) analysis for the reliability analysis, G-theory analysis for item analyses and scale and sub-dimensions score analyses were made.

## RESULTS

106 athletes (age:  $20.51 \pm 5.22$  years, height:  $179.29 \pm 6.60$  cm, body weight:  $70.61 \pm 9.72$  kg and body mass index:  $21.92 \pm 2.35$  kg/m<sup>2</sup>) were included in the study. Almost 95.3% of the athletes were male and 4.7% were female.

Athletes have a regular exercise plan of  $4.7 \pm 1.04$  days (minimum: 1 day, maximum 7 days), and the average duration of the daily exercise session is calculated as  $89.57 \pm 22.16$  min. When the physical activity levels of the athletes are examined, it is determined that 81.1% of them are competitive athletes, 13.2% of them are recreational athletes and 5.7% of them are physically active individuals.

While 34% of the participants did not have any pain/limitation due to injury, it was seen that 17.9% of them were in the period of 'acute injury,' 15.1% of them were in the period of 'subacute injury' and 33% of them were in 'persistent injury' period.

In the descriptive analyses of the scale, the participants who did not have a musculoskeletal problem chose the 'no problem' answer. Those who perceived their situation as problematic chose the options of 'mildly' and 'moderately'. The average of the answers was calculated as  $2.25 \pm 0.29$  points [Table 1].

### Validity analyses

#### Construct validity

For the construct validity of the scale, the Kaiser-Meyer-Olkin (KMO) test was performed first. The KMO result was calculated as 0.871, and the scale was evaluated as factorable. Exploratory factor analysis was carried out, and, in line with the original scale, the scale was divided into three sub-dimensions.

Whether the three-factor original structure of the DPA-TR SF-10 is adaptable by Turkish culture has been examined using CFA. The fact that t values, which give information about the latent variables' explanation ability of observable variables, are above 1.96, exceeding 2.56 at the level of 0.05, indicating the significance at the level of 0.01. The t-values obtained from the CFA are shown in Table 2. When the t-values obtained from CFA were examined, it was seen that the t-values of all items were significant at the level of 0.001. It was not necessary to remove any items from the scale.

In order to demonstrate the adequacy of the model tested using CFA, the fit indices obtained as a result of the analysis were also examined. In this context, the fit index of the model of the scale with three sub-dimensions was evaluated as a perfect fit, and other fit indices were evaluated as acceptable fit. The perfect and acceptable fit results acquired in terms of fit indices

**Table 1: Descriptive analyses of Disablement in the Physically Active Scale-Turkish Short Form-10**

	No problem (%)	Does not affect (%)	Slight (%)	Moderate (%)	Severe (%)	Mean±SD
Item 1	36.8	7.5	27.4	20.8	7.5	2.54±1.36
Item 2	34.9	17.9	26.4	15.1	5.7	2.38±1.26
Item 3	38.7	8.5	25.5	19.8	7.5	2.49±1.37
Item 4	47.2	18.9	19.8	11.3	2.8	2.03±1.17
Item 5	40.6	14.2	16.0	19.8	9.4	2.43±1.42
Item 6	39.6	8.5	23.6	16.0	12.3	2.52±1.45
Item 7	40.6	20.8	23.6	6.6	8.5	2.21±1.27
Item 8	59.4	24.5	14.2	1.9	-	1.58±0.80
Item 9	46.2	22.6	17.0	7.5	6.6	2.05±1.24
Item 10	42.5	19.8	19.8	5.7	12.3	2.25±1.38
Total						2.25±0.29

SD: Standart deviation

show that the three-factor model obtained after the CFA is at a sufficient level of fittingness. This shows that the scale can be used with three sub-dimensions of the original scale [Table 3 and Figure 1].

*Concurrent validity*

Within the scope of concurrent validity, the correlation between the DPA-TR SF-10 and PCS sub-scale of the SF-12 scale was examined. In the assessment, the correlation between DPA-TR SF-10 and PCS sub-scale of SF-12 scale was examined. Findings showed that there is a high level of correlation between DPA-TR SF-10 and PCS sub-score of the SF-12 scale ( $r = 0.61$ ;  $p < 0.01$ ).

*Reliability analysis*

In the reliability analysis of the DPA-TR SF-10 Scale using classical test theory, Cronbach’s alpha value was calculated as 0.91 and in the reliability analysis using G-coefficient, the value was calculated as 0.91.

*Item analyses*

When the study data are evaluated using G-theory, the estimated relative value of the variance component for individuals (50.4%) indicates that the scores have a high discrimination index in representing population scores. The fact that the percentage of variance component predicted for the items is 4.7% and lower than the relative value of individuals means that the item effectivenesses are similar. The fact that the percentage of variance component estimated for the individual-item (44.9%) is high indicates that the rate of systematic/non-systematic errors is low [Table 4].

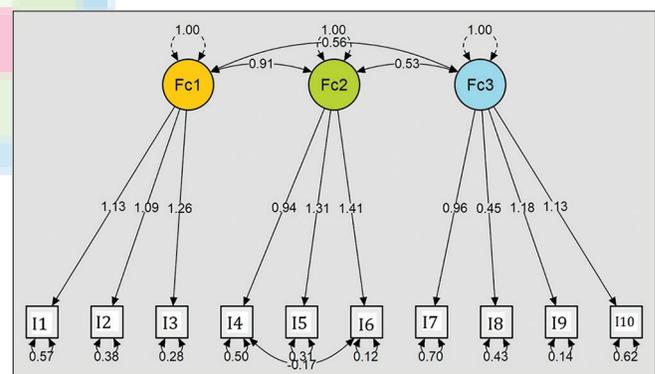
The total score of the participants of the DPA-TR SF-10 was calculated as  $22.53 \pm 9.78$ . Impairment summary component value of the scale was calculated as  $7.42 \pm 3.67$ , functional limitations summary component value was calculated as  $7 \pm 3.74$  and quality of life summary component value was  $8.11 \pm 3.98$  [Table 5].

In order to facilitate the calculation of DPA-TR SF-10 scores, the sum of the points given in 5-point Likert was evaluated without subtracting 3 or 4 points from the sub-dimensions. Thus, the lowest score of DPA-TR SF-10 is 10, and 50 is the highest score. As the score obtained from the scale increases, insufficiency in physical activity increases.

**Table 2: T values obtained from confirmatory factor analysis for Disablement in the Physically Active Scale-Turkish Short Form-10**

Impairments summary component		Functional limitations summary component		Quality of life summary component	
Statement	T	Statement	T	Statement	T
Item 1	11.19*	Item 4	10.97*	Item 7	5.81*
Item 2	11.19*	Item 5	10.97*	Item 8	5.81*
Item 3	12.29*	Item 6	10.33*	Item 9	9.78*
				Item 10	8.77*

\* $P < 0.001$



**Figure 1:** Confirmatory factor analysis of Disablement in the Physically Active Scale-TR ShortForm-10

**DISCUSSION**

The original language of the scale is different from the main language spoken in Turkey. Therefore, the original scale developed by Baker cannot be used for Turkish-speaking individuals. The aim of the study was to (Baker et al. 2019) adapt into Turkish DPA SF-10 consisting of 10 items, which was developed by Baker et al. to examine the insufficiency in physical activities. In this context, first, the construct validity of the scale was examined using CFA. When the t-values obtained from the CFA were examined, it was seen that this value was significant for all items.

In terms of concurrent validity, the correlation between the DPA-TR SF-10 and PCS sub-scale of the SF-12 scale was

**Table 3: Confirmatory factor analysis of for Disablement in the Physically Active Scale-Turkish Short Form-10**

Analysed fit indices	Perfect fit	Acceptable fit	Fit indices obtained from the first level of CFA	Conclusion
$\chi^2/SD$	$0 \leq \chi^2/SD \leq 2$	$2 \leq \chi^2/SD \leq 3$	1.68	Perfect fit
RMSEA	0.00	$0.05 \leq RMSEA \leq 0.10$	0.56	Acceptable fit
	$RMSEA \leq 0.05$			
CFI	$0.95 \leq CFI \leq 1.00$	$0.90 \leq CFI \leq 0.95$	0.81	Acceptable fit
NFI	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI \leq 0.95$	0.94	Acceptable fit
GFI	$0.95 \leq GFI \leq 1.00$	$0.90 \leq GFI \leq 0.95$	0.91	Acceptable fit

NFI: Normed fit index, CFI: Comparative fit index, GFI: Goodness of fit index, RMSEA: Root mean square error of approximation, SD: Standart deviation, CFA: Confirmatory factor analysis

**Table 4: Variance analysis of Disablement in the Physically Active Scale-Turkish Short Form-10 by using G-theory**

Source	SS	df	MS	Components				SE
				Random	Mixed	Corrected	Percentage	
B	1004.83491	105	9.56986	0.87858	0.87858	0.87858	50.4	0.13089
M	85.00849	9	9.44539	0.08171	0.08171	0.08171	4.7	0.03800
BM	740.89151	945	0.78401	0.78401	0.78401	0.78401	44.9	0.03603
Total	1830.73491	1059					100	

SE: Standard error, SS: Sum of square, MS: Mean of square, B: Participant (b), M: Item (m), BM: Participant-item interaction

**Table 5: Disablement in the Physically Active Scale-Turkish Short Form-10 scores**

	n	Minimum	Maximum	Mean ± SD
Impairments summary component	106	3	15	7.42 ± 3.67
Functional limitations summary component	106	3	15	7.00 ± 3.74
Quality of life summary component	106	4	19	8.11 ± 3.98
Total score	106	10	47	22.53 ± 9.78

SD: Standart deviation

examined. Findings showed a high level of correlation between DPA-TR SF-10 and PCS sub-score of SF-12 scale.

The estimated Cronbach's alpha reliability coefficient was determined to be sufficient with 0.91. This coefficient value indicates that the scores obtained from DPA-TR SF-10 have a high level of reliability. The item analysis results used in evaluating the discrimination of items show that all items of the scale are distinctive.

DPA SF-10 was introduced to the literature in 2019. We do not yet have any knowledge regarding the adaptation of this brand new scale in other languages. Therefore, it is not possible to compare the data we obtained in the adaptation study of DPA-TR SF-10 with the adaptation data to be made in other languages.

## CONCLUSION

The main purpose of this study was to evaluate by using area-specific and Turkish-adapted scales the adequacy of physically active individuals and athletes in terms of physical activities and the level of inadequacy they experience in terms of physical activity after their musculoskeletal injuries. At the end of the study, DPA-TR SF-10 was provided as a valid and reliable measurement tool in Turkish to be used in the evaluation of physically active individuals/athletes. We recommend that this

scale be used to evaluate the physically active population and in the follow-up of the treatment process after musculoskeletal injuries.

## Financial support and sponsorship

Nil.

## Conflicts of interest

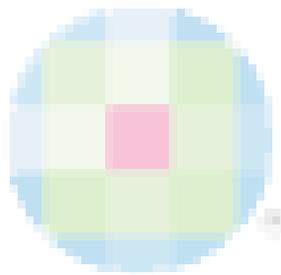
There are no conflicts of interest.

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## APPENDIX

### Appendix 1: Disablement in the Physically Active Scale-TR Short Form-10

Fiziksel Aktiflikte Yetersizlik Ölçeği Kısa Form-10.

#### Açıklamalar

Lütfen her bir bölümdeki her bir soruya sadece bir adet cevap veriniz. Son 24 saatteki sorununuzu en iyi tanımlayan ifadeyi yuvarlak içerisine alarak işaretleyiniz. Her sorunun altında olası tanımlayıcı ifadeler yer almaktadır. Tüm tanımlayıcılar size uygun olmayabilir ancak sık karşılaşılan örnekler verilmiştir.

#### Anahtar

1. Sorun yok
2. Sorun (lar) var ama beni etkilemiyor
3. Sorun (lar) beni hafif derecede etkiliyor
4. Sorun (lar) beni orta derecede etkiliyor
5. Sorun (lar) beni ciddi derecede etkiliyor.

	Sorun yok	Etkilemiyor	Hafif	Orta	Ciddi
Bozukluklar Özet Bileşeni	1	2	3	4	5
Ağrı - "Ağrım var mı?"	0	0	0	0	0
Hareket - "Hareket bozukluğum var mı?" (Örneğin; Hareket açıklığında/kolaylığında, esneklikte azalma ve/veya artmış tutukluluk)	0	0	0	0	0
Kas Fonksiyon - "Kas fonksiyon bozukluğum var mı?" (Örneğin; kuvvette, güçte, dayanıklılıkta azalma ve/veya artmış yorgunluk)	0	0	0	0	0
Fonksiyonel Kısıtlılıklar Özet Bileşeni	1	2	3	4	5
Stabilite - "Bozulmuş stabilitem var mı?" (Örneğin; Yaralanmış alanda gevşeklik, boşalma hissi veya bitkinlik, tükenip dayanamama)	0	0	0	0	0
Yön değiştirme - "Aktivite sırasında yön değiştirmede zorluğum var mı?" (Örneğin; kıvrılma, dönme, hareketi başlatma/bitirme, keskin dönüş, sabit ayak üzerinde dönme)	0	0	0	0	0
Beceri performansı - "Fiziksel aktivite için gerekli olan becerilerimi sergilemede zorluğum var mı?" (Örneğin; kıvrılma, dönme, hareketi başlatma/bitirme, keskin dönüş, sabit ayak üzerinde dönme)	0	0	0	0	0
Yaşam Kalitesi Özet Bileşeni	1	2	3	4	5
İyilik hali - "Aşağıdakilerle ilgili zorluk yaşıyor muyum?"					
Artmış belirsizlik, stres, baskı ve/veya kaygı	0	0	0	0	0
Takım, sosyal çevre/arkadaş ve/veya çalışma arkadaşları ile olan ilişkilerde değişim	0	0	0	0	0
Genel enerji azalması	0	0	0	0	0
Ruh halindeki değişiklikler ve/veya artmış hayal kırıklığı	0	0	0	0	0
TOPLAM PUAN					