

# A validity and reliability study of the Turkish Checklist Individual Strength (CIS) questionnaire in musculoskeletal physical therapy patients

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## ABSTRACT

**Background and purpose:** The aims of this study were the following: (1) to develop a Turkish version of the Checklist Individual Strength Questionnaire (CIS-T); (2) to evaluate the reliability and validity of the CIS-T; and (3) to compare the fatigue levels between musculoskeletal physical therapy patients and healthy subjects. **Methods:** The questionnaire was adapted to Turkish using a 'back translation' method. Fifty healthy subjects and 165 musculoskeletal physical therapy patients (128 outpatients and 37 inpatients) were evaluated. To validate the CIS-T, all participants answered both the CIS-T and the Short Form-36 (SF-36). The CIS was re-administered one week later for test–retest reliability. **Results:** The internal consistency reliability of the CIS-T was Cronbach's  $\alpha = 0.87$  and the interclass correlation coefficient reliability was  $r = 0.92$ . The item-discriminant validity ranged from  $r = 0.10$  to  $0.63$ . The correlations between the total scores of the scale and the subscale scores of the SF-36 were significant and negative ( $p < 0.01$ ). The total CIS scores were significantly higher in musculoskeletal physical therapy patients (inpatients) than in healthy subjects, but there was no significant difference between musculoskeletal physical therapy patients (outpatients) and healthy subjects ( $p < 0.05$ ). **Conclusion:** The CIS-T was a valid and reliable scale for assessing fatigue in physical therapy patients and the fatigue levels of musculoskeletal physical therapy patients were higher than those of healthy subjects.

## INTRODUCTION

Although it is often identified as a sign or symptom of a disease state or as a side effect of treatment, fatigue is essentially a subjective experience. Fatigue has largely defied efforts to conceptualize or define it in a way that separates it from normal experiences such as tiredness or sleepiness. An emphasis is usually placed on the degree and persistence of such experiences in the absence of any excessive expenditure of energy or effort as a cause. Thus, fatigue is typically defined as extreme and persistent tiredness, weakness or exhaustion (i.e. mental, physical, or both). Fatigue is common in the general population (David et al, 1990; Pawlikowska et al, 1994) and is the defining feature of the chronic fatigue syndrome (CFS).

However, it is also an important feature of a wide range of other conditions, including physical disease such as cancer, neurological diseases such as multiple sclerosis (MS) and Parkinson's disease, and psychiatric disorders such as depression. In these and other conditions, fatigue can be a major source of disability and is often reported by patients as being among their most severe and distressing symptoms (Fisk et al, 1994; Karlsen, Larsen, Tandberg, and Jorgensen, 1999; Pepper et al, 1993; Shulman, Taback, Bean, and Weiner, 2001; Winningham et al, 1994).

According to Lewis and Wessely (1992), fatigue is a subjective sensation with emotional, behavioural, and cognitive components. There is an essential difference between acute fatigue and long-term fatigue. Acute fatigue is characterized by reversibility, task specificity, and the functional use of compensation mechanisms. Acute fatigue is a normal phenomenon that disappears after a period of rest, when tasks are switched, or when particular strategies are used (e.g. working at a slower pace). In contrast, long-term fatigue is irreversible and

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not task specific, and the compensation mechanisms that can be useful in reducing acute fatigue are no longer effective (Lewis and Wessely, 1992). CFS is characterized by debilitating fatigue, widespread musculoskeletal pain, sleep impairments, headache, and symptoms of poor concentration and memory (Fukuda et al, 1994).

Chronic fatigue has been arbitrarily suggested as the primary symptom of CFS. Between 54% and 75% of CFS patients experience chronic widespread pain (Nishikai et al, 2001). Chronic fatigue with widespread muscle and joint pain has been suggested as an important subclass of CFS (Tan, Sugura, and Gupta, 2002), and the observed association between musculoskeletal pain severity and disability ( $r$  between 0.51 and 0.58) was similar to the association between fatigue severity and disability (Nijs et al, 2003, 2004). The latter findings suggests that musculoskeletal pain may be as significant as fatigue in CFS patients.

The instruments available to assess fatigue can be divided into unidimensional instruments and multidimensional instruments. According to Smets, Garsen, Bonke, and De Haes (1995), the use of unidimensional instruments excludes the possibility of a more complete description of fatigue. The wording of a single question can introduce substantial differences and may emphasize only one dimension of fatigue (Lewis and Wessely, 1992). Therefore, we have chosen the multidimensional Checklist Individual Strength Questionnaire (CIS) for this study (Vercoulen et al, 1994).

The multidimensional CIS was used to measure chronic fatigue. The CIS was designed to measure several aspects of fatigue, that correspond with our definition of fatigue. It consists of 20 statements for which the respondent has to choose from a seven-point Likert scale. The CIS is divided into four dimensions: (1) the subjective experience of fatigue (eight items); (2) reduction in motivation (four items); (3) reduction in activity (three items); and (4) reduction in concentration (five items) (Appendix 1). A total CIS score can be calculated by adding and summing the scores from the four dimensions. Higher scores indicate a higher degree of fatigue, more concentration problems, lower motivation, and less activity. The CIS was tested thoroughly in the clinical setting among patients with CFS and other chronic diseases and healthy controls (Vercoulen et al, 1994, 1996a, 1996b, 1996c; Vercoulen, Alberts, and Bleijenberg, 1999). The internal consistency of the CIS was found to be good; the Cronbach's  $\alpha$  for the total CIS was 0.90, and for the scales, the  $\alpha$  ranged from 0.83 to 0.92 (Vercoulen, Alberts, and Bleijenberg, 1999). The CIS was able to discriminate between

patients with the CFS, patients with MS, and healthy controls and the convergent validity was also satisfying (Vercoulen et al, 1996b). However, there are no data supporting the validity of the CIS in musculoskeletal physical therapy patients (inpatient and outpatient).

In Turkey, questionnaires are available for measuring fatigue. However, the reliability and validity of these questionnaires have not been thoroughly evaluated (Armutlu et al, 2007). Therefore, we conducted this study (1) to develop a Turkish version of the CIS-T; (2) to evaluate the reliability and validity of the CIS-T; and (3) to compare the fatigue levels between musculoskeletal physical therapy patients and healthy subjects.

## METHODS

This study was approved by Clinical Research Ethics Committee of Dokuz Eylul University School of Medicine.

### Development of the CIS-T

We obtained permission to use the CIS from its author and we translated the questionnaire into Turkish, using a recommended procedure (Guillemin, Bombardier, and Beaton, 1993). First, the questionnaire was independently translated into Turkish by an English lecturer from the Dokuz Eylül University School of Foreign Languages. Second, an English lecturer from Dokuz Eylül University independently re-translated this Turkish version back into English. A third English lecturer from Dokuz Eylül University then compared the translations to the original CIS, and a consensus version was agreed upon. Following the completion of the translation procedure, a panel of 10 healthy subjects was convened to ensure that the questionnaire reflected the concerns and the usual language of the subjects rather than those of the professionals. The panel was given three tasks: (1) the subjects responded to the questionnaire; (2) they were probed about their responses and asked to comment on each of the items in the translated version and were encouraged to express any difficulty they had understanding the items; (3) for those items with alternative expressions, they were asked to identify the alternative that best conformed to their language usage. The committee of translators considered both the results of these activities and the differences between the back-translation and the original and, discussed each problematical item until a reconciled final version was developed. The

questionnaire was then administered to all subjects. The author agreed that the back-translated version was conceptually and linguistically equivalent to the original CIS. The CIS-T is shown in Appendix 2.

## Participants

A total of 165 musculoskeletal physical therapy patients were recruited from the Dokuz Eylül University Hospital School of Physical Therapy and Rehabilitation outpatient clinic and the Dokuz Eylül University Hospital inpatient clinic between January and December 2008.

Patients who had psychiatric comorbidities (e.g. major depression) or other conditions, including physical diseases (e.g. cancer), neurological diseases (e.g. MS and Parkinson's disease) and who reported having uncontrolled or untreated medical illnesses (e.g. anaemia or diabetes) were excluded from the study.

In addition, 50 healthy subjects were recruited from the Dokuz Eylül University campuses. Individuals who did not report any medical illnesses within the previous six months or who did not report any uncontrolled or untreated illnesses (e.g. anaemia or diabetes) were allowed to participate.

Finally, written or oral informed consent was obtained from all subjects before administration of the questionnaire.

## Reliability of the CIS-T

The internal consistency of the scale was assessed using Cronbach's  $\alpha$  (Cronbach, 1951). The CIS questionnaire was administered to the same subjects one week later to assess the test-retest reliability. After the participants provided informed consent, the test-retest reliability was examined using the interclass correlation coefficient (ICC). The item-discriminant validity was calculated, using the item-discriminant correlation.

## Validity of the CIS-T

A principal component analysis was conducted to verify that the factor structure of the CIS-T was the same as that of the subscales of the CIS.

The concurrent validity of the CIS-T was assessed, using correlation with the Short Form-36 (SF-36). The SF-36 was constructed to survey health status in the Medical Outcomes Study. The SF-36 was designed for use in clinical practice and research and

assesses eight health domains: (1) limitations in physical activities because of health problems; (2) limitations in social activities because of physical or emotional problems; (3) limitations in routine activities because of physical health problems; (4) bodily pain; (5) general mental health (i.e. psychological distress and well-being); (6) limitations in usual role activities because of emotional problems; (7) vitality (i.e. energy and fatigue); and (8) general health perceptions (Ware, Snow, Kosinski, and Gandek, 2000). A Pearson correlation analysis was used to determine concurrent validity.

## Fatigue in musculoskeletal physical therapy patients

The fatigue levels of musculoskeletal physical therapy patients (inpatient and outpatient) with healthy subjects were assessed using the independent sample *T*-test.

## RESULTS

Two hundred and fifteen volunteers participated; 131 (60.9%) were women and 84 (39.1%) were men. Table 1 shows the demographics of the participants.

## Reliability of the CIS-T

The reliability of the CIS was evaluated in terms of its internal consistency reliability and its test-retest reliability. The internal consistency reliability for the total scale, as assessed by Cronbach's  $\alpha$ , was 0.87. The internal consistency reliability for the subscales was as follows: subjective fatigue was 0.85; concentration was 0.72; motivation was 0.42; and physical activity was 0.48.

The test-retest reliability was determined using 181 participants. The test-retest reliability, as assessed by the ICC, was 0.92. The item-discriminant validity was between  $r = 0.10$  and 0.63 (Table 2).

## Validity of the CIS-T

The results of the principal component analysis of the CIS-T showed, the factor structure  $f$ , which was assumed to be the same as that of the original CIS. Although factor analysis did not show an ideal model fit, the whole path coefficients from all the subscales to their items were high.

TABLE 1 Demographic characteristics of subjects.

Age (year)( $X \pm SD$ )	40.94 $\pm$ 12.80
BMI (kg/m <sup>2</sup> ) ( $X \pm SD$ )	25.13 $\pm$ 4.27
Education Level, <i>n</i> (%)	
Primary education	72 (33.5)
Secondary education	73 (34.0)
University	58 (27.0)
Posrgraduate	12 (5.6)
Occupation, <i>n</i> (%)	
Unemployed	9 (4.2)
Retired	42 (19.5)
Housewife	50 (23.3)
Working	96 (44.7)
Student	18 (8.4)
Diagnosis, <i>n</i> (%)	
Healthy	50 (23.3)
Musculoskeletal-outpatient	128 (59.5)
Musculoskeletal-inpatient	37 (17.2)
Sport, <i>n</i> (%)	
No	175 (81.4)
Once a week	8 (3.7)
Two and more a week	32 (14.9)
Smoke, <i>n</i> (%)	
No	152 (70.7)
Yes	63 (29.3)
Physical therapy history, <i>n</i> (%)	
No	126 (58.6)
Once	58 (27.0)
Two and more	31 (14.4)

TABLE 2 Item-discriminant validity and Chronbach  $\alpha$  of CIS-T.

Questions of CIS	Item-discriminant validity	$\alpha$
CIS-1	0.53	0.86
CIS-2	0.56	0.86
CIS-3	0.28	0.87
CIS-4	0.59	0.86
CIS-5	0.26	0.87
CIS-6	0.60	0.86
CIS-7	0.21	0.87
CIS-8	0.42	0.86
CIS-9	0.59	0.86
CIS-10	0.32	0.87
CIS-11	0.45	0.86
CIS-12	0.42	0.86
CIS-13	0.57	0.86
CIS-14	0.63	0.86
CIS-15	0.10	0.87
CIS-16	0.57	0.86
CIS-17	0.41	0.87
CIS-18	0.52	0.86
CIS-19	0.52	0.86
CIS-20	0.59	0.86

Notes: Cronbach  $\alpha$ , 0.87; ICC, 0.92.

For concurrent validity, the correlation between the eight subscales of the SF-36, the total CIS scores and the four subscales of the CIS-T are shown in Table 3. The correlations between the subscales of the SF-36, the total CIS scores and the four subscales of the CIS-T were negative and significant ( $p < 0.01$ ).

### Fatigue in musculoskeletal physical therapy patients

The total CIS score and the subjective experience subscale score were both significant in healthy subjects and musculoskeletal physical therapy outpatients ( $p < 0.05$ ). The total CIS score and the CIS subscales scores were not significant between healthy subjects and musculoskeletal physical therapy inpatients. The CIS subscales of motivation and physical activity were significant between musculoskeletal physical therapy inpatients and musculoskeletal physical therapy outpatients ( $p < 0.05$ ) (Table 4).

## DISCUSSION

We translated the CIS, which was used to measure prolonged fatigue in different populations, into Turkish. The author of the original version agreed that the back-translated version was equivalent to the original CIS.

### Reliability and validity of the CIS-T

Although principal component analysis did not reveal an ideal model fit, the correlation between the total CIS and the SF-36 subscales was negative and significant. The CIS-T revealed good reliability and acceptable validity in musculoskeletal physical therapy patients.

The internal consistency reliability of CIS-T was high. Aratake et al (2007) reported an ICC of 0.82 in the Japanese version. In our study, the ICC was 0.92, which is substantially higher.

A principal component analysis was conducted to determine whether the factor structure of the CIS-T could be considered equivalent to that of the original CIS, which was developed by Vercoulen et al (1994). One possible explanation as to why a good model fit was not obtained is that the sample was heterogeneous in terms of educational level, occupation, and diagnosis. In addition, the model, which was confirmed in overseas studies, might not be suitable for Turkish musculoskeletal physical therapy patients.

TABLE 3. The correlation analysis between CIS Questionnaire and SF-36.

	CIS				SF-36							
	1a	1b	1c	1d	2a	2b	2c	2d	2e	2f	2g	2h
1. CIS total	<b>0.894**</b>	<b>0.764**</b>	<b>0.720**</b>	<b>0.574**</b>	<b>-0.322**</b>	<b>-0.341**</b>	<b>-0.339**</b>	<b>-0.522**</b>	<b>-0.680**</b>	<b>-0.154*</b>	<b>-0.277**</b>	<b>-0.518**</b>
1a. Subjective experience of fatigue		<b>0.519**</b>	<b>0.516**</b>	<b>0.331**</b>	<b>-0.333**</b>	<b>-0.319**</b>	<b>-0.392**</b>	<b>-0.559**</b>	<b>-0.729**</b>	<b>-0.144*</b>	<b>-0.247**</b>	<b>-0.528**</b>
1b. Consantration			<b>0.415**</b>	<b>0.335**</b>	<b>-0.174*</b>	<b>-0.269**</b>	<b>-0.192**</b>	<b>-0.309**</b>	<b>-0.408**</b>	-0.113	<b>-0.191**</b>	<b>-0.289**</b>
1c. Motivation				<b>0.378**</b>	-0.088	<b>-0.139*</b>	<b>-0.163*</b>	<b>-0.360**</b>	<b>-0.465**</b>	-0.092	<b>-0.178*</b>	<b>-0.380**</b>
1d. Physical activity					<b>-0.319**</b>	<b>-0.249**</b>	<b>-0.147**</b>	<b>-0.216**</b>	<b>-0.277**</b>	-0.097	<b>-0.212**</b>	<b>-0.293**</b>
2. SF-36												
2a. Physical function						<b>0.564**</b>	<b>0.377**</b>	<b>0.236**</b>	<b>0.357**</b>	<b>0.285**</b>	<b>0.301**</b>	<b>0.209**</b>
2b. Physical role							<b>0.480**</b>	<b>0.309**</b>	<b>0.475**</b>	<b>0.346**</b>	<b>0.377**</b>	<b>0.285**</b>
2c. Pain								<b>0.319**</b>	<b>0.466**</b>	<b>0.259**</b>	<b>0.349**</b>	<b>0.287**</b>
2d. General health									<b>0.557**</b>	<b>0.226**</b>	<b>0.234**</b>	<b>0.459**</b>
2e. Vitality										<b>0.252**</b>	<b>0.307**</b>	<b>0.624**</b>
2f. Social function											<b>0.373**</b>	<b>0.341**</b>
2g. Emotional role												<b>0.406**</b>
2h. Mental health												-

\*p &lt; 0.05.

\*\*p &lt; 0.01.



TABLE 4 Fatigue levels of musculoskeletal physical therapy patients and healthy subjects.

	Healthy subjects ( $n = 50$ )	Outpatients ( $n = 128$ )	Inpatients ( $n = 37$ )
Age	32.86 ± 8.85	45.45 ± 11.62	36.27 ± 14.37
BMI	23.63 ± 3.90	25.99 ± 4.39	24.22 ± 3.62
CIS-T total	63.42 ± 22.85	71.11 ± 21.32	69.10 ± 23.10
Subjective experience	29.28 ± 12.92	33.78 ± 11.53	31.75 ± 11.70
Concentration	13.86 ± 6.42	15.82 ± 7.35	15.08 ± 8.07
Motivation	11.16 ± 4.27	11.98 ± 4.51	10.29 ± 4.26
Physical activity	8.62 ± 4.24	9.52 ± 4.61	11.97 ± 4.50

Further studies are needed to clarify the explanation for not obtaining a good model fitting. However, the study by Aratake et al (2007) on the validity and reliability of the CIS in Japanese workers also did not identify a good model fit with the original CIS either. Differences in model fitting might to be caused by cultural differences or differences among participants. The factor structure of the original CIS was based on patients with CFS. The study by Aratake et al (2007) evaluated workers, and in this study, we assessed patients with musculoskeletal diseases.

The concurrent validity of the total CIS score was assessed by its correlation with the SF-36. No gold standard exists for evaluating fatigue. Therefore, we cannot prove the validity of the instrument that measures fatigue. In the absence of a gold standard, direct comparisons of methods for measuring fatigue with related and existing measures are needed (Beurskens et al, 2000). In this study, we compared the discriminant ability of the CIS with quality-of-life because the participants were mostly patients. The corresponding correlation coefficients between the total CIS score and the SF-36 subscales were negative and significant.

### Fatigue in musculoskeletal physical therapy patients

The fatigue levels were lower in healthy people than in musculoskeletal physical therapy outpatients. In particular, the subjective experience of fatigue and physical activity subscale scores were higher in outpatients than in healthy controls. Although there was no significant difference between healthy people and inpatients, the CIS scores were lower in the healthy group. Vercoulen et al (1994) studied 298 patients with CFS, 61 patients with functional bowel disorder and 60 healthy subjects. In this study, subjects were evaluated with the CIS, and fatigue levels

were determined to be significantly lower in the healthy subjects than in the two other groups.

Another study by Vercoulen et al (1996a) compared 246 CFS patients with 53 healthy subjects. Patients were reassessed after 18 months and were categorized into three groups: (1) recovered; (2) improved; and (3) not improved. To assess fatigue, the authors used the subjective experience of fatigue and physical activity subscales of the CIS. They found that healthy subjects reported lower levels of fatigue than did the other groups. These findings support the findings of our study.

In contrast, when we compared inpatients with outpatients, with the exception of the physical activity subscale, the subscale scores were higher among outpatients than inpatients.

Outpatients had the highest total CIS score, followed by inpatients and healthy subjects. Consequently, fatigue levels were higher in musculoskeletal physical therapy patients. However, future systematic studies are needed.

Finally, this study had several limitations. The participants had several different musculoskeletal diagnoses. We were not able to recruit participants using specific diagnoses, which might have affected the results of the study. Further studies using specific diagnoses are needed to confirm the reliability and validity of the CIS-T. In conclusion, the CIS-T has good reliability and concurrent validity and appropriate for assessing musculoskeletal physical therapy patients.

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## APPENDIX 2

### Checklist Individual Strength (CIS)

***Bu sayfada 20 ifade bulacaksınız. Bu ifadelerden son 2 hafta boyunca kendinizi nasıl hissettiğinizi hakkında bilgi edineceğiz***

*Durumlardan hiçbirini atlamayın ve her birine işaret koyun*

1. Kendimi yorgun hissediyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
2. Kendimi oldukça canlı hissediyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
3. Herhangi bir durumu düşünmek çaba gerektiriyor	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
4. Fiziksel olarak bitkin hissediyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
5. Canım her çeşit güzel şeyi yapmak istiyor	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
6. Zinde hissediyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
7. Bir gün içinde oldukça fazla şey yapıyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
8. Herhangi bir şey yaparken dikkatimi çok iyi toplayabilirim	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
9. Kendimi güçsüz hissediyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
10. Gün boyunca fazla bir şey yapamıyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
11. İyi konsantrasyon olabiliyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
12. Kendimi dinlenmiş hissediyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
13. Dikkatimi toplamakta zorluk çekiyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
14. Fiziksel olarak kendimi kötü hissediyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
15. Yapmak istediğim birçok planım var	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
16. Çok çabuk yoruluyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
17. Yaptıklarımın memnun olmuyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
18. Bir şey yapmak için istek duymuyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
19. Düşüncelerim kolayca dağılıyor	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil
20. Fiziksel olarak iyi durumda olduğumu hissediyorum	Evet, doğru 1...2...3...4...5...6...7 Hayır, doğru değil

#### SKORLAMA

**2,5,6,7,8,11,12,15,20 için :**

*Evet doğru 1...2...3...4...5...6...7 Hayır doğru değil*

**1,3,4,9,10,13,14,16,17,18,19 için :**

*Evet doğru 7...6...5...4...3...2...1 Hayır doğru değil*

*Ardından 4 alt başlık hesaplanıyor:*

**1. Alt Başlık: Yorgunluğun Subjektif Hissedilmesi**

**sorular 1,4,6,9,12,14,16,20**

**2. Alt Başlık: Konsantrasyon**

**sorular 3,8,11,13,19**

**3. Alt Başlık: Motivasyon**

**sorular 2,5,15,18**

**4. Fiziksel Aktivite**

**sorular 7,10,17**

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