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HEALTH SERVICES RESEARCH

The Cross-Cultural Adaptation, Reliability, and Validity of the Copenhagen Neck Functional Disability Scale in Patients With Chronic Neck Pain

Turkish Version Study

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Study Design. The study design was cross-cultural adaptation and investigation of reliability and validity of the Copenhagen Neck Functional Disability Scale (CNFDS).

Objective. The aim of this study was to translate the CNFDS into Turkish language and assess its reliability and validity among patients with neck pain in Turkish population.

Summary of Background Data. The CNFDS is a reliable and valid evaluation instrument for disability, but there is no published the Turkish version of the CNFDS.

Methods. One hundred one subjects who had chronic neck pain were included in this study. The CNFDS, Neck Pain and Disability Scale, and visual analogue scale were administered to all subjects.

Results. For investigating test-retest reliability, correlation between CNFDS scores, applied at 1-week interval, intraclass correlation coefficient score for test-retest reliability was 0.86 (95% confidence interval = 0.679–0.935). There was no difference between test-retest scores ($P < 0.001$). For investigating concurrent validity, correlation between total score of the CNFDS and the mean visual analogue scale was $r = 0.73$ ($P < 0.001$). Concurrent validity of the CNFDS was very good. For investigating construct validity, correlation between total score of the CNFDS and the Neck Pain and Disability Scale was $r = 0.78$ ($P < 0.001$). Construct validity of the CNFDS was also very good.

Conclusion. Our results suggest that the Turkish version of the CNFDS is a reliable and valid instrument for Turkish people.

Key words: chronic neck pain, neck disability questionnaires, the Copenhagen Neck Functional Disability Scale, reliability, validity.

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Mechanical neck pain and/or dysfunction are major causal factors in disability and lost workdays.[1] This dysfunction is nearly as prevalent as low back pain,[2] almost as important a cause for disability and lost workdays. Although in many cases, the exact cause of mechanical neck pain and/or dysfunction remains elusive, a broad spectrum of physical, psychological, and social medical factors may contribute to patient prognosis.[3] Most likely, these medical factors influence functional outcome activities in ways that are beyond the traditional investigation of general signs and symptoms, thus necessitating the use of a functional outcome questionnaire.[4,5]

Clinical assessment of the pain and disability associated with neck conditions typically involves some form of self-report from individuals having the problem.[6] There are currently several relevant questionnaires that have been developed and published in English: the Neck Disability Index (NDI),[7] Neck Pain and Disability Scale (NPDS),[8] Northwick Park Neck Pain Questionnaire,[9] Disability Rating Index,[10] Copenhagen Neck Functional Disability Scale (CNFDS),[11] Cervical Spine Outcome Questionnaire,[12] and Functional Rating Index.[13] Although disability questionnaires for low back pain such as the Roland Morris and Oswestry have been translated into many languages,[14] there have been fewer cross-cultural adaptations of neck pain and disability questionnaires.[6]

Translating a questionnaire, instead of creating a questionnaire, allows comparisons of different populations,[4] permits researchers to examine functional status across a broad spectrum of people, and permits the exchange of information across cultural and linguistic barriers.[15] It is now widely recognized that questionnaires intended for use across cultures must not only be translated well linguistically but also adapted culturally to maintain the content validity of the instrument.[16]

The Neck Disability Index and the Northwick Park Neck Pain Questionnaire are adaptations of the Oswestry Low Back Pain Disability Questionnaire,[15] including both pain and disability within the same index, although pain and disability have been identified as separate dimensions.[17,18] Including pain and disability in the same scale may lead to difficulty assessing interventions, particularly involving populations of patients with disability in which pain improvements may be limited and the focus of the intervention is aimed at improving patients' ability to manage daily activities.[11] The NPDS also includes both pain and disability dimensions. The CNFDS assesses disability related to neck.[11]

At the time of study, there was only one validated Turkish version of the neck pain questionnaire, the NPDS. Bicer et al[4] conducted cross-cultural adaptation of the NPDS and reported that patients had difficulty answering the questions and in contradiction to mark NPDS consisting of complete vertical lines, semicomplete vertical lines, and the areas between the lines.[4] In contrast to the NPDS, the CNFDS is easily understood by patients and has no visual analogue scale (VAS), which some patients find difficult to use. The amount of text is minimal, so the time to complete the questionnaire is short. Most important, the CNFDS uses qualitative items and the clinical relevance of changes in item scores is readily perceived.[19] For these reasons, we decided to use the CNFDS.

The aim of this study was to translate the CNFDS into Turkish language and asses its reliability and validity among patients with neck pain in Turkish population.

MATERIALS AND METHODS

The Ethics Committee approved the study. We received permission to translate and make cross-cultural adaptation of the scale into Turkish language. No funds were received in support of this work.

Participants

One hundred one subjects were included in this study (66 women, 35 men) who had chronic neck pain (for at least 3 mo). Exclusion criteria used for the study were tumors, traumatic injuries, acute whiplash injuries, vertebral fractures, psychiatric disorders that cause neck pain, arthritis, cervical myelopathy, and illiteracy.

Scales

Copenhagen Neck Functional Disability Scale

A patient-completed scale was developed in 1998 by Jordan et al.[11] The CNFDS consists of 15 items that evaluate the impact of neck pain. Questions were individually answered with yes (0 points), occasionally (1 points), and no (2 points). To avoid repetitive answering, scores reverse values after the fifth question (yes = 2, occasionally = 1, and no = 0). Therefore, the total score can range from 0 (no impact of neck pain) to 30 (worst possible impact). Items 1 and 5 directly evaluate pain severity; items 2, 3, 4, 5, 7, 8, 9, and 10 evaluate disability during everyday activities; and items 6, 9, 11, 13, and

14 focus on social interactions and recreational activities. The last, item 15, evaluates the patient's perception of the future impact of the neck pain.[19]

Neck Pain and Disability Scale

The Turkish version of the NPDS was conducted by Bicer et al. in 2004.[4] The NPDS is a multidimensional questionnaire, consisting of 20 items involving 4 dimensions: neck problems, pain intensity, effect of neck pain on emotion, and its effect on life activities.[12] Each item has a 10-cm VAS. It has 6 major divisions, divided into equal intervals by vertical bars. Midpoints for each interval are marked with 2 dots (half a point on a vertical slash). Scoring of each item varies along a continuous scale from 0 to 5.[8,20]

Visual Analogue Scale

A VAS is a vertical line, 100 mm in length, with bottom of the line indicating "no pain" and top of the line worst pain; possible score lies between 0 and 10. Subjects were administered with the VAS to assess for pain in the morning, afternoon, and evening and then mean VAS score was calculated that ranged from 0 to 30.

TRANSLATION AND CULTURAL ADAPTATION

Permission was obtained for the translation of the CNFDS. The translation and cross-cultural adaptation process used the following guidelines proposed by Beaton et al[16]:

Step 1: Forward translation to Turkish. Two bilingual translators whose mother language was Turkish translated the scale. One translator was not aware of the study and concept and has no medical and clinical background. The other was a health care professional. Translators aimed at the conceptual equivalent of a word or phrase and used natural and acceptable language for the broadest audience range.

Step 2: Synthesis. Two translators and 1 researcher conducted the interview to compare the translated scales to determine any discordant or ambiguous word. By consensus, a single version of the translated scales was obtained.

Step 3: Backward translation to English. Two translators whose mother language was English back-translated the scales. They did not know the purpose of the study and were totally blind to the original version of the scale. They separately translated the scale into English, which was obtained by consensus.

Step 4: Expert committee. The expert committee consisted of 4 translators who were in step 1 and step 2 and 2 physiotherapists. Committee reviewed all the translation and adaptation process and compared the Turkish version of the scale with the original version of the scale. Consensus in terms of semantic equivalence (*i.e.,* ensuring that the words mean the same thing), idiomatic equivalence (*i.e.,* formulation of equivalent expressions for colloquialisms), experiential equivalence (ensuring that each item properly captured the experience of daily life in target culture), and conceptual equivalence (ensuring that items hold the same conceptual meaning) was achieved. The committee made the following changes:

In the first question, "without neck pain" translated into Turkish as "boyun agrınız olmaksızın" was changed to "boyun agrısı olmadan," which could be read in English as "not having neck pain."

In the fourth question, "take more time than usual" translated into Turkish as "daha fazla zaman alıyor" was changed to "daha fazla zaman harcamaksızın," which could be read in English as "spend more time than usually do."

In the thirteenth question, "nearest family" translated into Turkish as "yakın aile" was changed to "aile," which could be read in English as "family" because in Turkish, the word "family" also means as "nearest family."

After these slight changes, prefinal version of the scale was achieved.

Step 5: Pretesting. Prefinal version of the scale was completed by 30 subjects who have had neck pain and asked them any misunderstanding, conflicting, or ambiguous word or sentence. Subjects did not have any questions about the scale. All the questions were well accepted by patients. There was no multiple answer question. After the pilot study, the final version of the scale was obtained.

RELIABILITY MEASUREMENTS

Test-Retest Reliability
For the test-retest reliability, the questionnaire was completed 2 times. The period between measurements was 7 days. Test-retest reliability was determined by using intraclass correlation coefficient (ICC) and Pearson correlation analysis. During this period, no medical treatment was given. ICCs can vary from 0.00 to 1.00, with values of 0.60 to 0.80 regarded as evidence of good reliability and those above 0.80 indicating excellent reliability.[21,22]

Validity

Concurrent Validity
For criterion-related validity, concurrent validity method was used. For this purpose, the relation between the CNFDS and the mean VAS was examined by Pearson correlation analysis.

Construct Validity
The construct validity was examined by comparing total scores of the CNFDS with the NPDS.

Construct validity coefficients were accepted as follows: $r \geq 0.81–1.0$ as excellent, 0.61–0.80 very good, 0.41–0.60 good, 0.21–0.40 fair, and 0–0.20 poor.[21] The relation was evaluated with Pearson correlation analysis.

RESULTS

Participants
Data were collected for 101 subjects. Each subject was asked to fill the CNFDS, the NPDS, and the mean VAS. To evaluate test-retest reliability, 26 of 101 subjects who had chronic neck pain and were randomly selected were asked to fill the CNFDS again after 1 week. Demographic data are listed in Table 1.

TABLE 1. Baseline Participant Demographics (N = 101)*	
Variable	**n (%)**
Gender	
Female	66 (65)
Male	35 (35)
Marital status	
Married	85 (84)
Divorced	1 (1)
Single	8 (8)
Widow(er)	7 (7)
Education	
Elementary	59 (58)
Mid school	7 (7)
High school	20 (20)
Graduate school	15 (15)
*Age: mean (SD) = 43.05 (12.44); range = 25–73.	

Test-Retest Reliability
For investigating test-retest reliability and correlation between CNFDS scores, applied at 1-week interval, the ICC score for test-retest reliability was 0.86 (95% confidential interval = 0.679–0.935). There was no difference between test-retest scores ($P < 0.001$).

Concurrent Validity
For investigating concurrent validity, correlation between total score of the CNFDS and the mean VAS was $r = 0.73$ ($P < 0,001$). The concurrent validity of the CNFDS was very good.

Construct Validity
For investigating construct validity, correlation between total score of the CNFDS and the NPDS was $r = 0.78$ ($P < 0.001$). The construct validity of the CNFDS was also very good.

DISCUSSION
This study showed that the CNFDS is a valid and reliable method of measuring disability in Turkish patients with neck pain.

For the test-retest reliability, ICC was 0.86 at 1-week intervals (ICC values above 0.80 were accepted as excellent reliability).[21] Jordan *et al*,[11] who were developers of the questionnaire, administered the CNFDS on patients who underwent surgery for cervical disc herniation and had chronic neck pain. Test-retest reliability was evaluated with short-term (same day) and between-day (evaluated by mail 2 days later) reliability analyses, achieving a Pearson correlation coefficient of 0.99 and 0.98, respectively. At the time we conducted the study, there was no other study to investigate reliability of the

CNFDS. Forestier et al[19] conducted the French version study of the CNFDS, but their study design did not allow for assessment of test-retest reliability. Other studies that investigate reliability of the neck questionnaires in Turkish population, for example, the Turkish version of the NPDS and the NDI, have similar ICC scores. Bicer et al[4] conducted the study concerning chronic neck pain and reported that for the reliability of the NPDS, the Cronbach α value as 0.86, and Aslan et al[23] conducted a study concerning patients with chronic neck pain who were administered with the NDI and found that ICC score was 0.979 at 1-week interval. Vernon and Mior[7] applied the NDI at 1-week interval to patients who have had neck pain due to whiplash injury and without trauma and found the ICC score to be 0.89. Cees et al,[24] who conducted the study with 1-week follow-up to examine reliability of the Dutch version of the NDI, found that the ICC score was 0.90. All of these results are similar to our findings. indicating a high adaptation in test-retest reliability of the CNFDS in Turkish culture.

For investigating concurrent validity, correlation between the CNFDS and mean VAS scores was 0.73, which was very good. Jordan et al[11] assessed construct validity by comparing the Copenhagen scale scores with self-reported pain scores and with global assessments of clinicians and patients. Pearson correlation coefficients were high both for the Copenhagen scale and pain scores ($r = 0.83$) and for the patients' global assessment ($r = 0.89$). The values were moderate for the doctors' global assessment ($r = 0.56$). Forestier et al[19] reported that correlation between the CNFDS and VAS scores had weak correlation. Bicer et al[4] reported that correlation between the Turkish version of the NPDS and VAS scores was also weak ($r = 0.45$). Aslan et al[23] reported r values of 0.659 and 0.728 on investigating relation between the Turkish version of the NDI and VAS scores. Vernon and Mior[7] compared NDI scores with scores on the McGill Pain Questionnaire, reporting similar moderately high correlations (0.69–0.70). In the study of Wlodyka-Demaille et al,[25] correlation coefficient between the NDI and VAS scores and the NPDS and VAS scores was 0.48 and 0.515, respectively.

For investigating construct validity, correlation between total scores of the CNFDS and the NPDS was very good ($r = 0.78$). Jordan et al[11] regarded the CNFDS as being content valid because of the good correlation of the CNFDS with other measurements, including self-reported pain and both patients' and doctors' global assessments. In a French version study of the CNFDS, the most CNFDS items assessed were weakly correlated to the 36-Item Short-Form Health Survey item score.[19]

In the Turkish version of the NDI conducted by Aslan et al,[4] correlation between the NDI and the NPDS was 0.659 to 0.728. In the Turkish version of the NPDS conducted by Bicer et al, correlation between the NPDS and Pain Disability Index was 0.51.

In our study, in total, only 23 of 1515 (1.51%) questions were unanswered. There were no multiple answer questions. Five subjects did not answer question 3, which was related to disability for daily living activities, and 6 subjects did not answer question 8, which was related to reading activities. Missing data are shown in Table 2. There are no data related to unanswered questions or missing items in previous studies of the CNFDS,[11,19] but Jordan et al[11] reported that subjects had no difficulty understanding and using the scale. In the study of Wlodyka-Demaille et al,[25] a few items were unanswered (1.98%, 1.98%, and 2.97% for the NDI, the NPDS, and the NPQ, respectively). There were also a few multiple answer questions (6.93%, 4.95%, and 5.94% for the NDI, the NPDS, and the NPQ, respectively). In the Italian version study of the NPDS-I,[26] a few missing responses were recorded (1.7%), whereas no multiple answer questions were found. Cross-cultural adaptation of the German version of the NPDS was conducted by Bremerich et al,[27] who reported that in total, 11 of 2160 items were missing (0.5%). In the NDI and the NPAD, some items related to "driving," "working activity," and "medication" had least response. Mousavi et al[20] reported that some subjects did not answer a few items (42%, 9%, and 15% items related to "driving," "reading," and "medication," respectively). In the Turkish version study of the NDI, 23.87% subjects did not answer the items related to the "driving."[23] In the Turkish version study of the NPDS, only 19.6% subjects answered the items related to the "driving." Lee et al[6] reported that a high number of missing values noted for items were related to "driving" (64/180 missing) in the NDI and items relevant to the "medications" (37/180 missing) in the NPDS. Lee et al[6] also reported that these missing values could occur because both items make presumptions about patients, which may not be true. In the CNFDS, there are no presumptive questions.

TABLE 2. Response to CNFDS Questions				
CNFDS	No. Subjects	No. Answered Questions	Missed Questions	% Unanswered Questions
Q1	101	101	0	0.00
Q2	101	101	0	0.00
Q3	101	96	5	4.95
Q4	101	101	0	0.00
Q5	101	100	1	0.99
Q6	101	100	1	0.99
Q7	101	99	2	1.98
Q8	101	95	6	5.94
Q9	101	99	2	1.98
Q10	101	101	0	0.00
Q11	101	101	0	0.00
Q12	101	101	0	0.00
Q13	101	100	1	0.99
Q14	101	98	3	2.97
Q15	101	99	2	1.98
CNFDS indicates Copenhagen Neck Functional Disability Scale.				

In our study, we did not record the time to complete to the CNFDS by the patients.

CONCLUSION

The results suggest that the Turkish version of the CNFDS was reliable and valid for the assessment of pain and associated disability for patients with chronic neck pain in the Turkish-speaking population.

> ## ➤ Key Points
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> ❑ This study was cross-cultural adaptation and investigation of reliability and validity of the Turkish version of the CNFDS.
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> ❑ The authors investigated the reliability and validity of the Turkish version of the CNFDS on patients with chronic neck pain.
>
> ❑ The results suggest that the Turkish version of the CNFDS is reliable and valid for the assessment of pain and associated disability for patients with chronic neck pain in the Turkish-speaking population.

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