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Original Article

Cross-Cultural Adaptation and Psychometric Testing of the Urdu version of Copenhagen Neck Functional Disability Scale

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ABSTRACT

Neck pain is one of the common problems among people. Different measures have been developed to assess the rate of neck pain and disabilities. Patients with neck pain frequently use and easily understand the Copenhagen neck functional disability scale (CNFDS). **Objective:** To cross-culturally adapt and translate CNFDS into Urdu and examine the psychometric properties of Urdu version of CNFDS (CNFDS -U) in individuals with non-specific neck pain (NSNP). **Methods:** The CNFDS was translated into Urdu and cross-culturally adapted in compliance with the established standards. This study was carried out on 200 patients having neck pain and 50 healthy respondents. The CNFDS-U, Neck Bournemouth Questionnaire (NBQ), and Neck Pain Disability Index Urdu version (NDI-U) were all completed by a combined 200 individuals with NSNP and 50 healthy subjects. The patients with NSNP completed the aforementioned questionnaires and Global Rating of Change Scale (GROC) following three weeks of physiotherapy. CNFDS-U was evaluated for psychometric testing. **Results:** The CNFDS-U shows excellent internal consistency (α = 0.84) and test-retest reliability ($ICC_{2,1}$ =0.97). Regarding construct validity, moderate correlations exist between CNFDS-U and NBQ (r=0.51, p<0.001) and CNFDS-U and NDI-U (r=0.64, p<0.001). Its responsiveness was demonstrated by a statistically significant difference in CNFDS-U change scores between improved and stable groups (p< 0.001). **Conclusions:** The CNFDS-U is a valid, reliable, and responsive scale for evaluating NSNP in populations that can understand Urdu.

INTRODUCTION

Neck pain is a universal complaint that is increasing gradually among the general population [1]. It has a significant influence on individual's functional activities, their families, communities, and health care system [2]. One of the four prevalent musculoskeletal problems is neck discomfort/pain whose risk factors are linked to female gender, old age, high job demand, low social or work support and a history of previous neck pathology that can develop neck pain [3-5]. Non-specific neck pain (NSNP) is the term used to describe a condition where there is no identifiable underlying illness or faulty anatomical structure causing the discomfort [5]. Excessive exertion and forceful repetitive movements can cause mechanical injury to muscles which may lead to pain in neck, shoulder and adjacent parts of the body [6]. Neck pain and disability is also common problem in workplace, computer users and online workers that use mobile, computer, and laptops for 8-10 hours, due to this their musculoskeletal system are affected resulting in neck fatigue, neck pain, and reduced range of motion that progress to disability [5, 7, 8]. During clinical examination of neck pain and its related disability, different scales are used to evaluate this [9]. The Copenhagen neck functional disability scale (CNFDS) is also one of the reliable and valid tools constructed by

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Jorden *et al.*, in 1998 to measure neck pain & disability [10]. It is the Danish-authorized questionnaire which was originally developed in English language and translated into Brazilian, Arabic, Italian, Iranian, Turkish, Persian, French, Polish, and Chinese [11-19]. Assessing neck pain also requires taking into account how it affects social and emotional facets of daily life in addition to how it affects physical functionality [10]. The CNFDS excels in this area since it addresses neck pain, daily activities, and social interactions. Therefore, CNFDS might be a better tool if a more comprehensive assessment is required. As this scale has still not been translated into Urdu, the goal of this investigation was to translate and cross-culturally adapt CNFDS in Urdu as well as examine the psychometric features of CNFDS-U in patients with NSNP.

METHODS

This was a translation, cultural adaptation, and psychometric evaluation study. For the sample size, 10 subjects per item of instrument were taken into consideration as guided for general psychometric testing [20]. The minimum sample size required was 150 and data were collected from 200 patients and 50 healthy participants from multiple settings in Rawalpindi/ Islamabad using convenient sampling technique. The study was conducted over a period of one year from April, 2022 to March, 2023, following approval from ethics review committee of the Margalla Institute of Health Sciences. All participants provided their informed written consent and after obtaining permission from the tool developer, this tool has been translated into Urdu. Convenient sampling technique was used to gather data who met inclusion criteria, including patients with NSNP, both genders between ages of 18 and 65, patients able to read Urdu and fifty healthy participants between ages of 18 and 65 with no history of neck pathology or pain. The study did not include patients with diagnosed psychiatric conditions, myelopathy, neck or brain surgery/vertebral fractures within last three months, neurological impairments, infections/inflammation, tumors, or systemic disorders and healthy participants who were not willing to participate were not included in study. On the first day, all participants were requested to complete a self-structured questionnaire for demographic information as well as the CNFDS-U, NDI-U, and NBQ. 48 hours after the initial response, 46 randomly chosen patients were asked to complete the CNFDS-U form once more. Patients receive routine physical therapy session for 3 weeks as per advised by his/her consultant therapist. After three weeks, patients were asked to complete these questionnaires again along with the GROC scale. The CNFDS is a valid and reliable self-reported scale consisting of 15 questions that assess the effects of neck pain, including patient's views of those impacts in their future (Questions 1, 5 & 15), disability during daily activities (Questions 2, 3, 4, 5, 7, 8, 9, 10 & 12), and social and recreational activities (Questions 6, 9, 11, 13 & 14). For calculating scores following procedures are considered. For items 1 to 5 "yes" =0, "sometimes" =1, and "no" =2. For items 6 to 15 the answer "yes" =2, "sometime"=1, and "no" =0. Thus, having a total score i.e. 0 to 30, with higher scores indicating greater disability [10]. The NDI-U has ten sections. Each item has six distinct claims that range from 0 to 5, with 0 denoting no disability and 5 denoting the greatest degree of disability. The highest possible total score is 50, which is expressed in percentage. The higher scores represent greater disability. Its reliability and validity have been proven in literature [21]. The NBQ is reliable and valid tool that consists of seven items. On 11-point numerical rating scale (0–10), each question receives a score. The BQN has a maximum score of 70 points [9, 22]. The GROC is a 15-point scale designed to assess how much a patient believes their pain has become worse or better over time. Patients were asked to rank the general health of their neck from -7 ("very much worse") to +7("very much better") since the commencement of treatment. The GROC scale offers good sensitivity and reproducibility and is simple to use [23]. The translation and cultural adaptation were based on the Beaton *et al.*, recommendations [24]. First, two forward translations were made of questionnaire from English in Urdu by two bilingual experts who were native Urdu speakers. Translator I was Physical therapist and aware of the study's purpose and content, while Translator II was linguistic expert had no medical background. Then the translators and two researchers synthesized results of translations (T1) & (T2) following discussion of any modifications, producing a common translation (T-12). The T-12 version was then independently translated back into English by two translators. The back-translations (BT1 & BT2) were produced by two bilingual translators and they preferably lacked a medical background and were unaware of the concepts presented. An expert committee including all translators, researchers and one senior physical therapist, discussed all translated versions and finally developed pre-final Urdu version of questionnaire, to establish parity between the English and Urdu versions, important judgements must be made. The pre-final CNFDS-U was tested 40 patients for face validity. The final CNFDS-U was developed and subjected to further psychometric testing. The Cronbach's alpha (α) was used to evaluate the CNFDS - U's internal consistency [25]. When Cronbach's alpha is between 0.6 and 0.80, it is considered good, and when α is between 0.81 and 0.95, it is taken as excellent [26]. In order to conduct a test-retest, a randomly selected group from the sample completed the CNFDS-U during their second

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visit, which was held 48 hours after the first one, without receiving any therapy in the interval [27]. Utilizing a two-way mixed analysis of variance, test-retest reliability was evaluated using the intra-class correlation (ICC2,1). The ICC is expressed poor, moderate, good or excellent when it is less than 0.5, 0.5–0.75, 0.76–0.9 and greater than 0.9 respectively [28]. The standard error of measurement (SEM) = SD × $\sqrt{}$ (1–ICC) and smallest detectable change (SDC) = SEM × 1.96 × $\sqrt{}$2 were used to examined measurement error [29]. In order to determine content validity of an item, it is necessary to look at degree of item completion and the magnitude of the floor and ceiling effects. Ceiling and floor effects were deemed to be found if greater than 15% of respondents scored highest or lowest possible score [30]. In this study, construct validity was checked by examining association between CNFDS -U and NDI-U, and NBQ using Pearson coefficient (r). Inadequate, weak, moderate, strong, and very strong relationships are indicated by values between 0.00 and 0.09, 0.10-0.39, 0.40-0.69, 0.70-0.89, and 0.90-1.00 respectively [31]. The CNFDS-U were expected to have moderate to strong association with NDI-U and NBQ [10, 11, 13, 14, 16, 19]. Discriminative validity was evaluated by comparing total CNFDS- U score between patients and healthy controls using independent t-test [20, 21]. It was expected that the two group's total scores would differ significantly from one another. At least 75% of results matching the hypothesis were required for validity to be deemed good [32]. Exploratory factor analysis was used to establish the dimensions of questionnaire items. In order to determine whether factor analysis was adequate, Bartlett's test of sphericity and Kaiser-Meyer-measure Olkin's of sample adequacy (KMO) were utilized. Principal component analysis was observed using varimax rotation [20, 32]. Three conditions must be met for factor extraction with a 3-priori criterion. A scree plot with a second point inflection, an eigenvalue > 1.0 and variance > 10% [33, 34]. Using GROC scale, patients were categorized into groups that were stable (GROC score less than 3) & improved (GROC score greater than or equal to 3) [21]. An independent t-test were used to compare the change scores of the CNFDS-U between the stable and improved groups in order to assess responsiveness and using Pearson coefficient(r), change scores of CNFDS-U -U versions were correlated with change scores of NBQ and NDI-U [35]. The Statistical Product and Service Solution (SPSS) version 25.0 was used to perform statistical analyses. Statistical significance was calculated by p-value ($p < 0.05$).

RESULTS

Following predefined guidelines, original CNFDS was translated into Urdu and culturally adapted. While returning to context of original version, the entire adaptation procedure was completed without encountering any linguistic difficulties or conceptual misunderstandings. The CNFDS-U was completed by 40 participants with NSNP during preliminary testing. Because it was short and clearly related to their current problem, participants had no trouble filling it out. The preliminary test results showed no issues with vocabulary or subject matter used in Urdu version. The CNFDS-U -U was therefore accepted without any modifications to original tool. A total 250 participants were enrolled in this study, including 200 patients having NSNP and 50 healthy participants. Of 200 patients, 7 were excluded due to having infectious disease, systemic disease, or neurological deficit. Thus 193 patients were finally included, but responsiveness was analyzed at sample size of 188 because 5 patients were dropped out due to altered duty timing, migration, or transportation issues. The demographic and clinical characteristics of participants are shown in table 1.

Table 1: The Demographics data and participants characteristics

Variables	Patient Group (n=193) Mean ± SD N/%	Healthy Group (n=50) Mean ± SD N/%
Age (years)	27.74 ± 9.27	24.10 ± 6.34
BMI	23.94 ± 5.67	23.56 ± 5.10
Neck Pain duration in months	7.03 ± 11.35	N/A
Gender		
Male	92 (47.7%)	11 (22%)
Female	101(52.3%)	39 (78%)
Marital status		
Single	128 (66.3%)	43 (86%)
Married	61 (31.6%)	7 (14%)
Divorced	2 (1%)	0
Widowed	2 (1%)	0
Qualification		
Matric	32 (16.6%)	0
Intermediate	101 (52.3%)	43 (86%)
Graduate	44 (22.8%)	4 (8%)
Postgraduate	16 (8.3%)	3 (6%)
Occupation		
Employed	87 (45.1%)	18 (36%)
Unemployed	106 (54.9%)	32 (64%)
CNFDS-U (0-30)	10.48 ± 6.28	0
NBQ (0-70)	29.08±14.38	0
NDI-U (0-50)	14.26±9.27	0

The results showed excellent test-retest reliability for CNFDS-U ($ICC_{2,1}$ =0.97, 95% CI=0.94-0.98). An excellent Internal consistency was also obtained ($\alpha = 0.84$). The mean and reliability results of each item and total score are shown in table 2.

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Table 2: The mean and reliability results of CNFDS-U

Items CNFDS-U	1st Measurement Mean ± SD	2nd Measurement Mean ± SD	ICC	CI 95%	SEM	SDC
Item 1	0.55 ± 0.64	0.58 ± 0.64	0.78	0.62 - 0.88	0.30	0.83
Item 2	0.65 ± 0.77	0.58 ± 0.78	0.86	0.75 - 0.92	0.29	0.80
Item 3	0.43 ± 0.71	0.35 ± 0.62	0.75	0.57 - 0.86	0.36	0.98
Item 4	0.38 ± 0.67	0.45 ± 0.71	0.93	0.86 - 0.96	0.18	0.49
Item 5	0.43 ± 0.59	0.40 ± 0.59	0.75	0.57 - 0.86	030	0.82
Item 6	0.73 ± 0.88	0.80 ± 0.82	0.74	0.56 - 0.85	0.45	1.24
Item 7	0.60 ± 0.78	0.68 ± 0.80	0.78	0.62 - 0.88	0.37	1.01
Item 8	0.83 ± 0.55	0.98 ± 0.77	0.74	0.56 - 0.85	0.28	0.78
Item 9	1.18 ± 0.87	1.20 ± 0.82	0.78	0.60 - 0.87	0.41	1.13
Item 10	1.15 ± 0.83	1.10 ± 0.81	0.85	0.73 - 0.92	0.32	0.89
Item 11	0.63 ± 0.74	0.71 ± 0.78	0.75	0.57 - 0.86	0.37	1.03
Item 12	0.70 ± 0.82	0.85 ± 0.80	0.63	0.50 - 0.79	0.50	1.38
Item 13	0.63 ± 0.81	0.75 ± 0.84	0.84	0.72 - 0.91	0.32	0.90
Item 14	0.55 ± 0.75	0.58 ± 0.71	0.88	0.79 - 0.94	0.26	0.72
Item 15	1.08 ± 0.92	0.93 ± 0.80	0.81	0.66 - 0.89	0.40	1.11
TOTAL (0-30)	10.48±6.28	10.90±6.50	0.97	0.94-0.98	1.09	3.01

There were no multiple or missing answers. There was no floor and ceiling effects observed on CNFDS -U total score. KMO value was found by factor analysis to be adequately high (0.91) and Significant findings came from Bartlett's test. ($p<0.001$). The Eigenvalues larger than 1 and variance >10% demonstrated uni-dimensionality of tool and accounted for 43.6% of the total variance. Figure 1 shows Scree plot for the analysis of factors.

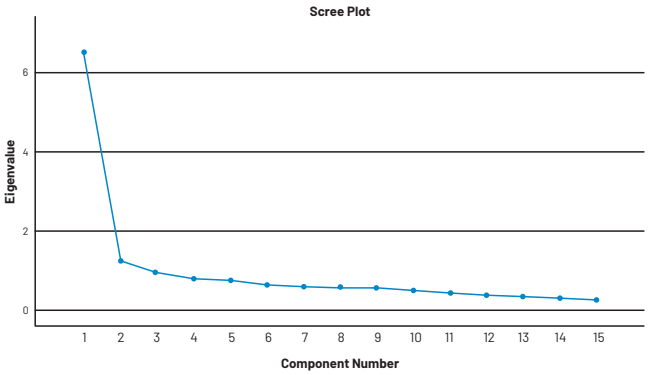

Figure 1: Scree plot showing 1- factor solution

Regarding construct validity, moderate correlations were found between CNFDS-U, NBQ and NDI-U as represented in table 3.

Table 3: Shows correlations among CNFDS-U, NDI-U & NBQ

Scales	CNFDS-U (n=193) r	p-value
NDI-U	0.64	<0.001
NBQ	0.51	

The results depicted a statistically significant difference in CNFDS -U total score between patients and healthy group ($p< 0.001$), indicating discriminate validity. The results revealed a significant difference ($p< 0.001$) in CNFDS-U change scores between the two groups, with the improved group (8.73 ± 7.71, n=154) having a higher change score than the stable group (3.62 ± 7.56, n=34). Moderate correlations exist between CNFDS-U, NBQ and NDI-U change score as shown in Table 4.

Table 4: Shows correlation among CNFDS-U, NDI-U & NBQ change scores

Scales	CNFDS-U CHANGE SCORE (n=187) r	p-value
NDI-U CHANGE SCORE	0.63	<0.001
NBQ CHANGE SCORE	0.61	

DISCUSSION

The CNFDS-U questionnaire was adapted from original CNFDS with no major changes made. The study's participants were predominately female which is consistent with studies done in past. In present study, participant's average age was 31.40 years, which is similar to Persian version's participant's average age (32.70 years) but less than participant's mean age in earlier research, which ranged from 43.05 to 54.3 years [13-16, 18]. The present study enrolled patients having NSNP, but it excluded people whose neck pain was brought on by other underlying illnesses including arthritis, myelopathy, neurological impairments, etc. that were associated with advancing age. This discrepancy may be result of this exclusion. The CNFDS-U showed excellent reliability in terms of test-retest ($ICC_{2,1}$ = 0.97). The ICC values in earlier researches ranged from 0.93 to 0.99 [11-14, 17, 19], with exception of Turkish version, which exhibited lower ICC values, i.e. 0.86 [15]. The longer interval (7 days) between test and retest can be credited for lower ICC value in this version. The CNFDS-U was determined to have excellent internal consistency (α =0.84). Similar to this, Cronbach alpha for CNFDS Italian and French version was 0.83,

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Brazilian and Iranian version was 0.84, and Arabic version was 0.85, however, range of Cronbach's alpha for versions in English, Polish and Persian was 0.90 to 0.92 [10, 11, 13, 14, 16-18]. The participants responded to all 15 items of CNFDS-U questionnaire so there were no missing values. The CNFDS-U showed no floor or ceiling effects in this investigation, these findings are consistent with Brazilian, Polish, and Italian versions of CNFDS [11, 13, 18]. A one-factor structure was found in this investigation. Although two-factor structure with Eigenvalues greater than 1.0 were found, however, only one factor had variance greater than 10%, accounting for 43.6% of the variation and corresponding to Scree plot's elbow or point of inflection. Therefore, one-factor structure was concluded. In both English and Brazilian versions of CNFDS, a single-dimension factor was identified [10, 14]. In Italian version, Exploratory factor analysis showed that first component (eigenvalue = 4.12) explained 83% of overall variability whereas second factor (eigenvalue = 0.65) explained just 13%. The second to first eigenvalue ratio was 6.36 so Angilecchia *et al.*, concluded unidimensional of CNFDS-Italian version [13]. In contrast, Persian version demonstrated a three-factor structure of CNFDS while Chinese version found two factors [16, 19]. It is possible that differences in cultural attitudes towards disability can account for this discrepancy in results. CNFDS-U has good construct validity, as evidenced by significant moderate correlations between CNFDS-U and NBQ (r=0.51), and NDI-U (r=0.64). However, Strong correlations between CNFDS and NDI in Italian (r=0.85), Brazilian (r=0.72), Persian (r= 0.73), Chinese (r=0.76) versions were observed [11, 13, 16, 19]. Strong correlation between CNFDS and NBQ were found in Italian version (r=0.71) while moderate correlation between CNFDS and NBQ in Chinese translation (r=0.60) [13, 19]. The CNFDS-U was found to have good responsiveness, consistent with Iranian version [14]. The current study found statistically significant differences (p<0.001) in CNFDS-U change scores between stable and improved group. There were moderate correlations found between change scores of CNFDS-U and NBQ (r=0.61), and NDI-U (r=0.63), similar to this, Chinese version showed a moderate correlation between CNFDS and NDI change score (r=0.43) [19]. This investigation has several limitations. Firstly, it is uncertain whether findings can be generalized to individuals with other causes of neck pain because only NSNP patients were included in this study. As individuals weren't chosen using a random technique, sample bias might also be present. The strength of this study is novelty of adapting CNFDS for Urdu-speaking population and conducting psychometric analysis of CNFDS-U. Additionally, translation of instrument and examination of its psychometric properties followed standards-based criteria.

CONCLUSIONS

The current study depicted that CNFDS-U is a valid, reliable, and responsive scale that may be used to evaluate pain and functional limitations in NSNP patients among Urdu speaking population.

Authors Contribution

Conceptualization: SN, MNF, AI, TZN, SMFR
Methodology: SN, MNF, AI, TZN, SMFR
Formal analysis: SN, MNF, AI, TZN, SMFR
Writing-review and editing: SN, MNF, AI, TZN, SMFR

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Jahre H, Grotle M, Småstuen M, Guddal MH, Smedbråten K, Richardsen KR, *et al.* Risk factors and risk profiles for neck pain in young adults: Prospective analyses from adolescence to young adulthood—The North-Trøndelag Health Study. Plos One. 2021 Oct; 16(8): e0256006. doi: 10.1371/journal.pone.0256006.

[2] Kazeminasab S, Nejadghaderi SA, Amiri P, Pourfathi H, Araj-Khodaei M, Sullman MJ, *et al.* Neck pain: global epidemiology, trends and risk factors. BMC musculoskeletal disorders. 2022 Dec; 23(1): 1-13. doi: 10.1186/s12891-021-04957-4.

[3] Bachtiar F, Maharani FT, Utari D. Musculoskeletal disorder of workers during work from home on covid-19 pandemic: a descriptive study. InInternational conference of health development. Covid-19 and the role of healthcare workers in the industrial era (ICHD 2020). Atlantis Press. 2020 Nov; 153-60.

[4] Jahre H, Grotle M, Smedbråten K, Dunn KM, Øiestad BE. Risk factors for non-specific neck pain in young adults. A systematic review. BMC Musculoskeletal Disorders. 2020 Dec; 21(1): 1-2. doi: 10.1186/s12891-020-03379-y.

[5] Jun D, Johnston V, McPhail SM, O'Leary S. A longitudinal evaluation of risk factors and interactions for the development of nonspecific neck pain in office workers in two cultures. Human Factors. 2021 Jun; 63(4): 663-83. doi: 10.1177/0018720820904231.

DOI: https://doi.org/10.54393/pjhs.v4i06.843

[6] Odebiyi DO and Okafor UA. Musculoskeletal Disorders, Workplace Ergonomics and Injury Prevention. InErgonomics-New Insights. IntechOpen. 2023 Feb. doi: 10.5772/intechopen.106031.

[7] Basakci Calik B, Yagci N, Oztop M, Caglar D. Effects of risk factors related to computer use on musculoskeletal pain in office workers. International Journal of Occupational Safety and Ergonomics. 2022 Jan; 28(1): 269-74. doi: 10.1080/10803548.2020.1765112.

[8] Tunçez IH, Demir LS, Kunt M, Şahin TK. Ergonomic evaluation of desk-bound work offices of a community health center and effect of ergonomic intervention on the health complaints of the workers. Nobel Medicus Journal. 2020 May; 16(2): 1-1.

[9] Bobos P, MacDermid JC, Walton DM, Gross A, Santaguida PL. Patient-reported outcome measures used for neck disorders: an overview of systematic reviews. Journal of Orthopaedic & Sports Physical Therapy. 2018 Oct; 48(10): 775-88. doi: 10.2519/jospt.2018.8131.

[10] Jordan A, Manniche C, Mosdal C, Hindsberger C. The Copenhagen Neck Functional Disability Scale: a study of reliability and validity. Journal of Manipulative and Physiological Therapeutics. 1998 Oct; 21(8): 520-7.

[11] Barreto FS, Pontes-Silva A, Oliveira FLB, de Oliveira Pires F, Bassi-Dibai D, Fidelis-de-Paula-Gomes CA, *et al.* Measurement properties of the Brazilian version of the Copenhagen Neck Functional Disability Scale in patients with chronic neck pain. European Spine Journal. 2022 Feb; 31(2): 346-52. doi: 10.1007/s00586-021-07070-1.

[12] Elbeltagy AM, El Sayed WH, Allah SS. Validity and reliability of the Arabic version of the Copenhagen Neck Functional Disability Scale in neck pain patients. Asian Spine Journal. 2018 Oct; 12(5): 817. doi: 10.31616/asj.2018.12.5.817.

[13] Angilecchia D, Mezzetti M, Chiarotto A, Daugenti A, Giovannico G, Bonetti F. Development, validity and reliability of the Italian version of the Copenhagen neck functional disability scale. BMC Musculoskeletal Disorders. 2018 Dec; 19(1): 1-9. doi: 10.1186/s12891-018-2332-z.

[14] Aghaei HN, Azimi P, Shahzadi S, Azhari S, Mohammadi HR, Alizadeh P, *et al*. Outcome measures of functionality, social interaction, and pain in patients with cervical spondylotic myelopathy: a validation study for the iranian version of the copenhagen neck functional disability scale. Asian Spine Journal. 2015 Dec; 9(6): 901. doi: 10.4184/asj.2015.9.6.901.

[15] Yapali G, Günel MK, Karahan S. The cross-cultural adaptation, reliability, and validity of the Copenhagen Neck Functional Disability Scale in patients with chronic neck pain: Turkish version study. Spine. 2012 May; 37(11): E678-82. doi: 10.1097/BRS.0b013e31824b549c.

[16] Ghasemi F, Yoosefinejad AK, Pirouzi S, Ghaem H. Evaluating the cross-cultural adaptation, reliability, and validity of the Persian versions of the copenhagen neck function disability scale and neck bournemouth questionnaire. Spine. 2019 Jan; 44(2): E126-32. doi: 10.1097/BRS.0000000000002781.

[17] Forestier R, Françon A, Saint Arroman F, Bertolino C. French version of the Copenhagen neck functional disability scale. Joint Bone Spine. 2007 Mar; 74(2): 155-9. doi: 10.1016/j.jbspin.2006.03.002.

[18] Misterska E, Jankowski R, Glowacki M. Cross-cultural adaptation of the Neck Disability Index and Copenhagen Neck Functional Disability Scale for patients with neck pain due to degenerative and discopathic disorders. Psychometric properties of the Polish versions. BMC Musculoskeletal Disorders. 2011 Dec; 12(1): 1-8. doi: 10.1186/1471-2474-12-84.

[19] Huang Z, Yan J, Li S, Yuan L, Zhang Y, Wu Y, *et al*. Psychometric validation of the simplified Chinese Copenhagen Neck Functional Disability Scale in patients with chronic nonspecific neck pain. PM&R. 2022 Jun. doi: 10.1002/pmrj.12863.

[20] Kyriazos TA. Applied psychometrics: sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in general. Psychology. 2018 Aug; 9(08): 2207. doi: 10.4236/psych.2018.98126.

[21] Farooq MN, Mohseni-Bandpei MA, Gilani SA, Hafeez A. Urdu version of the neck disability index: a reliability and validity study. BMC musculoskeletal disorders. 2017 Dec; 18: 1-1. doi: 10.1186/s12891-017-1469-5.

[22] Bolton JE and Humphreys BK. The Bournemouth Questionnaire: a short-form comprehensive outcome measure. II. Psychometric properties in neck pain patients. Journal of Manipulative and Physiological Therapeutics. 2002 Mar; 25(3): 141-8. doi: 10.1067/mmt.2002.123333.

[23] Bobos P, MacDermid J, Nazari G, Furtado R. Psychometric properties of the global rating of change scales in patients with neck disorders: a systematic review with meta-analysis and meta-regression. BMJ Open. 2019 Nov; 9(11): e033909. doi: 10.1136/bmjopen-2019-033909.

[24] Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000 Dec; 25(24): 3186-91. doi: 10.1097/00007632-

DOI: https://doi.org/10.54393/pjhs.v4i06.843

200012150-00014.
[25] Kennedy I. Sample size determination in test-retest and Cronbach alpha reliability estimates. British Journal of Contemporary Education. 2022 Feb; 2(1): 17-29. doi: 10.52589/BJCE-FY266HK9.
[26] Taber KS. The use of Cronbach's alpha when developing and reporting research instruments in science education. Research in Science Education. 2018 Dec; 48: 1273-96. doi: 10.1007/s11165-016-9602-2.
[27] Dawson J and Fitzpatrick R. Questionnaire on the perceptions of patients about total hip replacement. The Journal of Bone & Joint Surgery British Volume. 1996 Mar; 78(2): 185-90. doi: 10.1302/0301-620X.78B2.0780185.
[28] DeVon HA, Block ME, Moyle-Wright P, Ernst DM, Hayden SJ, Lazzara DJ, *et al*. A psychometric toolbox for testing validity and reliability. Journal of Nursing scholarship. 2007 Jun; 39(2): 155-64. doi: 10.1111/j.1547-5069.2007.00161.x.
[29] Mokkink LB, Boers M, Van Der Vleuten CP, Bouter LM, Alonso J, Patrick DL, *et al*. COSMIN Risk of Bias tool to assess the quality of studies on reliability or measurement error of outcome measurement instruments: a Delphi study. BMC Medical Research Methodology. 2020 Dec; 20: 1-3. doi: 10.1186/s12874-020-01179-5.
[30] Terwee CB, Prinsen C, Chiarotto A, De Vet H, Bouter LM, Alonso J, *et al*. COSMIN methodology for assessing the content validity of PROMs–user manual. Amsterdam: VU University Medical Center. 2018. Available at: https://cosmin.nl/wp-content/uploads/COSMIN-methodology-for-content-validity-user-manual-v1.pdf.
[31] Schober P, Boer C, Schwarte LA. Correlation coefficients: appropriate use and interpretation. Anesthesia & analgesia. 2018 May; 126(5): 1763-8. doi: 10.1213/ANE.0000000000002864.
[32] Terwee CB, Bot SD, de Boer MR, van der Windt DA, Knol DL, Dekker J, *et al*. Quality criteria were proposed for measurement properties of health status questionnaires. Journal of Clinical Epidemiology. 2007 Jan; 60(1): 34-42. doi: 10.1016/j.jclinepi.2006.03.012.
[33] Osborne JW. Regression & linear modeling: Best practices and modern methods. Sage Publications; 2017 Jan. doi: 10.4135/9781071802724.
[34] Arooj A, Amjad F, Tanveer F, Arslan AU, Ahmad A, Gilani SA. Translation, cross-cultural adaptation and psychometric properties of Urdu version of upper limb functional index; a validity and reliability study. BMC Musculoskeletal Disorders. 2022 Jul; 23(1): 691. doi: 10.1186/s12891-022-05628-8.
[35] Mokkink LB, Terwee CB, Knol DL, Stratford PW, Alonso J, Patrick DL, Bouter LM, De Vet HC. The COSMIN checklist for evaluating the methodological quality of studies on measurement properties: a clarification of its content. BMC Medical Research Methodology. 2010 Dec; 10(1): 1-8. doi: 10.1186/1471-2288-10-22.