# Validation of the Neck Disability Index in Serbian Patients With Cervical Radiculopathy

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## Abstract

**Objective:** The purpose of this study was to translate the Neck Disability Index into the Serbian language (NDI-S) and to investigate the validity of this version for use in Serbian population.

**Methods:** Fifty patients with cervical radiculopathy were enrolled in the study and completed a multidimensional questionnaire, including NDI-S. Inclusion criteria were ages between 18 and 65 years, Serbian speaking, no cognitive or hearing impairment, sharp and radiating neck and upper extremity pain that has lasted less than 12 months, radiculopathy signs evaluated by electromyoneurography and disc herniation, or spondylotic changes of cervical spine visualized on magnetic resonance imaging. Exclusion criteria were malignancy, previous cervical spine discectomy, trauma of the cervical spine and myelopathy, polyneuropathy, fibromyalgia, and psychiatric disorders. Validity was determined by the correlation of the Neck Disability Index, with pain measured by visual analogue scale, characteristics related to pain, and mental status. Also, factor structure of NDI-S was explored through factor analysis. Reliability was assessed through internal consistency (Cronbach's α and item-total correlations).

**Results:** Correlation analysis between pain and NDI-S showed significant values ($P < .01$). The NDI-S correlated well with patients mental status ($r = 0.421$, $P < .01$). Cronbach's α of NDI-S was 0.85, denoting excellent internal consistency of the questionnaire. Item-total correlations were significant and ranged from 0.328 to 0.789. Factor analysis demonstrated a 2-factor structure with an explained variance of 55%.

**Conclusion:** The NDI-S is a valid questionnaire to measure neck and arm pain related to disability in Serbian patients with cervical radiculopathy. (J Manipulative Physiol Ther 2018;xx:1-7)

**Key Indexing Terms:** *Radiculopathy, Cervical; Rehabilitation*

## Introduction

Cervical radiculopathy (CR) typically presents as neck pain radiating to the upper extremity and is most commonly due to the compression of a cervical nerve root that causes pain and disability.[1] Cervical radiculopathy affects approximately 1 person per 1000 of a population per year and is most often caused by degenerative spondylosis or a disk herniation.[1] One study reports that patients with upper arm pain are more disabled and have less improved quality of life compared with patients who have neck pain only.[2] Quantification of neck and upper extremity pain-related disability is crucial for the evaluation of the treatment and also for assessing clinical outcomes of disability.[3]

The Neck Disability Index (NDI) is a questionnaire developed by Vernon and Mior[4] that measures problems with neck movements, neck pain intensity, effect of neck pain on concentration, and the level of interference in daily life activities. It has been translated and validated in many study populations and has shown stable psychometric properties.[4-6] To our

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knowledge, no specific disease questionnaire that assesses disability in patients with neck pain and CR has ever been validated in Serbia. Therefore, the purpose of this study was to translate and validate the NDI in Serbian patients with CR.

## Methods

### Translation and Adaptation

The translation process was in accordance with standard methods that have been adopted internationally.[7] The NDI was first translated into Serbian by 2 research study doctors who were fluent in English and blinded to each other. The translation was examined by the study team that included research study doctors and 1 doctor from an English-speaking area (a Serbian doctor living and working in London). The Serbian version of the NDI (NDI-S) was then translated into English again by a professional translator who was blinded to the original English version of the NDI. The Serbian translation, English translation, and the original English version of the NDI were then reviewed by the study team again. After that, we pretested the questionnaire in a pilot study, which included 20 people with neck pain, to find possible problems in practice. The only problem in the translation process was the translation of the word "recreation" in the tenth, last item of the questionnaire. In Serbian, the word "recreation" refers to sports activities and exercise only, while in English it refers to all leisure time activities. So, we replaced "recreation" with "recreation and leisure time activities" (sports, walking, visiting friends, etc). In general, participants in the pilot study commented that the questions were clear. The final review of the translation included underlining and correction of grammatical errors. We did not notice any grammatical errors. The whole procedure of NDI translation lasted 1 month.

### Ethics Approval

The study was approved by the Medical School, University of Belgrade's research ethics committee. All participants provided signed informed consent before enrollment.

### Data Collection

This was a cross-sectional study including patients with CR who were seeking physical medicine treatment at the Institute and Clinic for Rehabilitation (Medical School, University of Belgrade). The minimum required sample size was determined to be 47 on the basis of 0.80 power and a significance level of 0.05 to detect a correlation coefficient of at least 0.4 between NDI-S and other variables.[8] The final sample included 50 patients.

Inclusion criteria included age between 18 and 65 years, Serbian speaking, no cognitive or hearing impairment, sharp and radiating neck and upper extremity pain that has lasted less than 12 months, radiculopathy signs evaluated by electromyoneurography, and disc herniation or spondylotic changes of cervical spine visualized on magnetic resonance imaging. Exclusion criteria were malignancy, previous cervical spine discectomy, trauma of the cervical spine and myelopathy, polyneuropathy, fibromyalgia, and psychiatric disorders.

Before therapy procedures, patients received a self-administered questionnaire covering several domains, such as sociodemographic and lifestyle data (sex, age, marital status, job status, smoking status, physical activity level) and intensity of neck and upper arm pain information, measured by visual analogue scale (VAS). Patients were asked about duration and frequency of pain, and they were also asked about the intensity of the worst and least pain measured by VAS in the past week, the intensity of pain at the moment of the interview and in the last 24 hours, nonsteroidal anti-inflammatory drugs (NSAIDs) consumption, NDI-S, and patient health questionnaire for depression (PHQ-9).

The VAS consisted of a horizontal line, 100 mm in length, with end points labeled "no pain" and the "worst, unbearable pain."[9] The patient was asked to place a mark on the line that corresponded to the intensity of the pain they were experiencing.

The PHQ-9 is a questionnaire for depression, with 9 questions that assess how often the respondent has been bothered by that symptom over the past 2 weeks, assigning values of 0 to 3 points (0, not at all; 1, several days; 2, more than half of the days; 3, nearly every day). A PHQ-9 score of 5, 10, 15, and 20 represents mild, moderate, moderately severe, and severe depression.[10]

The Neck Disability Index is a condition-specific questionnaire for self-reported disability. It is adapted from the Oswestry Low Back Pain Questionnaire[11] and consists of 10 items referring to different activities (personal care, lifting, driving, work, sleeping, concentration, reading, recreation) and pain (pain intensity, headache), with 6 possible answers for each item. Patients are instructed to choose only 1 answer that most closely suits their condition at the present time. The score of each item varies between 0 (no pain and no functional limitation) and 5 (worst pain and maximal limitation), resulting in a total score of 0 (no disability) to 50 (totally disabled).

### Statistical Analysis

The statistical analysis was conducted with SPSS version 21.0 for Windows (IBM Corp, Armonk, New York). To describe the demographic and pain-related characteristics of the patients, simple counts percentage, mean, and median values were used.

According to Vernon, 1 or 2 missing items were accepted, and the average score per item (total score divided by 9 or 8) was inserted.[12] If 3 or more items remained unanswered, the questionnaire was regarded as unacceptable and removed from further analyses.[12]

Potential floor and ceiling effects were determined by calculating the number of patients who obtained the lowest or the highest possible NDI-S scores. Floor and ceiling effects were considered to be present if more than 15% of patients achieved the lowest or highest score, respectively.[13]