

RESEARCH ARTICLE

Reliability and Validity Test of the Indonesian Version of the Nordic Musculoskeletal Questionnaire (NMQ) to Measure Musculoskeletal Disorders (MSD) in Traditional Women Weavers

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Abstract

Musculoskeletal disorder remains to be a health and safety problem. One of measuring instrument often use to assess musculoskeletal disorders worldwide is the Nordic musculoskeletal questionnaire (NMQ). This questionnaire translated into various languages and tested for its validity and reliability. However, it has limitations, such as the difficulty of application in countries that do not speak English. This study aims to test the validity and reliability of the Indonesian version of NMQ in women weavers working using traditional handlooms in East Kalimantan Indonesia from March to May 2018. The validity of items obtained ranges 0.501 (min.) to 0.823 (max.), and Cronbach's alpha reliability was 0.726. In conclusion, the NMQ in Indonesian version has satisfactory psychometric properties with adequate validity and reliability.

Key words: Musculoskeletal disorders, NMQ in Indonesian, reliability, validity

Uji Validitas dan Reliabilitas *Nordic Musculoskeletal Questionnaire* (NMQ) Versi Indonesia untuk Mengukur Gangguan Muskuloskeletal pada Penenun Tradisional Wanita

Abstrak

Gangguan muskuloskeletal masih menjadi masalah kesehatan dan keselamatan kerja. Salah satu alat ukur yang sering dipakai untuk mengkaji gangguan muskuloskeletal di seluruh dunia adalah *Nordic musculoskeletal questionnaire* (NMQ). Kuesioner ini telah diterjemahkan ke berbagai bahasa di dunia dan terbukti valid serta reliabel, tetapi memiliki keterbatasan di antaranya sulit diaplikasikan di negara yang tidak menggunakan bahasa Inggris sebagai bahasa sehari-hari. Penelitian ini bertujuan menguji validitas dan reliabilitas NMQ versi bahasa Indonesia pada penenun tradisional wanita di Kalimantan Timur periode Maret sampai Mei 2018. Didapatkan hasil uji validitas item berkisar antara 0,501 (min.) sampai 0,823 (maks.) dan indeks reliabilitas *Cronbach's alpha* sebesar 0,726. Simpulan, NMQ versi bahasa Indonesia cukup valid dan reliabel untuk mengukur gangguan muskuloskeletal.

Kata kunci: Gangguan muskuloskeletal, NMQ berbahasa Indonesia, reliabilitas, validitas

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Introduction

Musculoskeletal disorders (MSD) is a condition that can affect any part of the musculoskeletal system. It includes the muscles, bones, nerves, joints and spinal discs, along with supporting blood vessels and connective tissues such as tendons, ligaments, and cartilage. The symptoms, including pain, numbness, tingling, aching, stiffness, or burning.^{1,2} Musculoskeletal disorders have become increasingly prevalent worldwide during the past decade.³ It not only affects the workers' quality of life but also imposes a significant economic burden to the society.⁴ It also has a high health cost, and it constitutes a significant cause of occupational injury and physical disability in both developed and developing countries.⁵

MSD occurs in various industries, both formal and informal sectors. High-risk occupation including construction, agriculture, manufacturing, wholesale and retail trade, and human health and social work.⁵ Risk factors related to MSD include heavy physical work, forceful overexertion, awkward and sustained postures, repetitive movement, and vibration.⁶ A systematic review by da Costa and Vieira⁷ proposed that several biomechanical, psychosocial, and individual factors contributed to the occurrence of work musculoskeletal disorders (WMSD).

The syndrome of musculoskeletal work disorders includes pain and stiffness in various regions of the body like neck, shoulder, lower back, wrist, hand, and fingers.⁸ Based on various typical complaints, experts have compiled various instruments/questionnaires to examine the subjective complaints of WMSD.⁹ One of measuring instrument that is often used to assess musculoskeletal disorders worldwide is the Nordic musculoskeletal questionnaire (NMQ). With the support of the Nordic Council of Minister, the NMQ developed to create a simple, standardized questionnaire. It should be able to be used to detect and analyze musculoskeletal symptoms of different individuals in different parts of the body.¹⁰

The NMQ has several advantages over other measuring instruments. Some of them are: standardized questions, worldwide recognition, its free, provide self-evaluation, and relatively quick identification of the symptoms. It also has applicability in large populations and frequent use together with other evaluation methods such as rapid upper limb assessment (RULA),

rapid entire body assessment (REBA) and Ovako working posture analysis system (OWAS). However, NMQ also has limitations, among them is the difficulty of application in countries that do not speak English (for errors in translation, interpretation, and or validation) and restriction of exhaustive questions to three areas of the body (lower back, neck, and shoulders).¹¹

The NMQ has been translated into various languages and occupation and tested for its validity and reliability.^{4,8,12-16} However, the literature that discusses the results of the NMQ translation, validity, and reliability test in the Indonesian version is still limited. This study aims to simplification and translating NMQ into the Indonesian version. The make the NMQ accessible for the use in the Indonesian setting. Its validity and reliability tested in women weavers working using traditional handlooms in East Kalimantan Indonesia.

Methods

The study was on 50 "Samarinda Sarong" women weavers who work using traditional handlooms in Samarinda, East Kalimantan, Indonesia from March to May 2018. The traditional weaving "Samarinda Sarong" is one of Samarinda city tourism icons, which until now maintained because it is considered to have artistic value and high origin.

The NMQ¹⁰ is in two well-differentiated structures. The first part, the general one, refers to symptoms in 9 parts of the body (neck, shoulders, elbows, wrists/hands, upper back, lower back, hip/thighs, knees, and ankles/feet) during the last 12 months/7 days. The second part, the specific one, refers to symptoms in three parts of the body (neck, shoulders, and lower back) throughout the subject's working life/7 days beforehand. To answer this questionnaire, the subjects were asked to answer "yes" or "no" to the following question: "Have you any time during the last 12 months had trouble (ache, pain, discomfort) in— followed by a list and body diagram of the nine different anatomical areas. If the respondent marked "yes", then the respondent was asked to answer the question "Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?" and "Have you any trouble at any time during the last 7 days?" (Figure 1).

Data were analyzed by the Statistical Package

for the Social Sciences (SPSS) ver. 21, in order to describe continuous and qualitative variables, mean, standard deviation (SD) and percentage frequency used respectively.

Pearson product-moment correlation used to evaluate the construct validity of the total score of the NMQ per questionnaire is an association with the baseline. NQM Indonesian version considered as 'good to excellent' when $r \geq 0.75$, as 'good' when r ranged between 0.5 and 0.7, as 'fair' when r ranged between 0.25 and 0.50, and as 'little or no relationship' when r was less than 0.25. Cronbach's alpha intraclass coefficient and the 95% confidence interval (CI) of the point estimation calculated for the whole questionnaire. Cronbach's alpha values >0.70 were considered satisfactory.¹⁷⁻²⁰

The study was reviewed and approved by the Health Research Ethics Committee, Faculty of Medicine, Universitas Mulawarman, Samarinda with letter number: 33/KEPK-FK/IV/2018. Informed written consent requested from the participants before their participation.

Results

The majority of respondents in this study were

$>46-56$ years old (34%), the majority of marital status were married (96%), education level is mostly elementary school (graduated 6th grade) (62%), most of the working experience is more than 5 years (80%) and working time is mostly $>5-8$ hours per day (76%) (Table 1).

In this study, the NQM original version simplified from the type of chain question to a single question ("Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in"). Whereas, the answer option was changed from "yes" or "no" to a rating with 4 scales, i.e., no pain (A) (scale 0), moderate pain (B) (scale 1), pain (C) (scale 2) and very sick (D) (scale 3). The 28 body regions studied consist of: upper neck, lower neck, left shoulder, right shoulder, left upper arm, back, right upper arm, waist, buttock, bottom, left elbow, right elbow, left lower arm, right lower arm, left wrist, right wrist, left hand, right hand, left thigh, right thigh, left knee, right knee, left calf, right calf, left ankle, right ankle, left foot and right foot.

The question of NMQ and the 28 items/body region of NMQ translated into Indonesian from the English format producing three separate Indonesia version: one proposed by the author, one by a general medical practitioner,

Table 1 Respondents Characteristics

Variables	Number (n=50)	Percentage
Age (years)		
28-34	10	20
>34-40	8	16
>40-46	7	14
>46-56	17	34
>56-70	6	12
>70	2	4
Marital status		
Not married	2	4
Married	48	96
Education background		
Never went to school/did not graduate elementary school	10	20
Elementary school (graduated 6 th grade)	31	62
Secondary high school (graduated 9 th grade)	6	12
Senior high school (graduated 12 th grade)	3	6
Working experience (years)		
<5	11	20
>5	39	80
Working time per day (hours)		
3-5	9	18
>5-8	38	76
>8-10	3	6

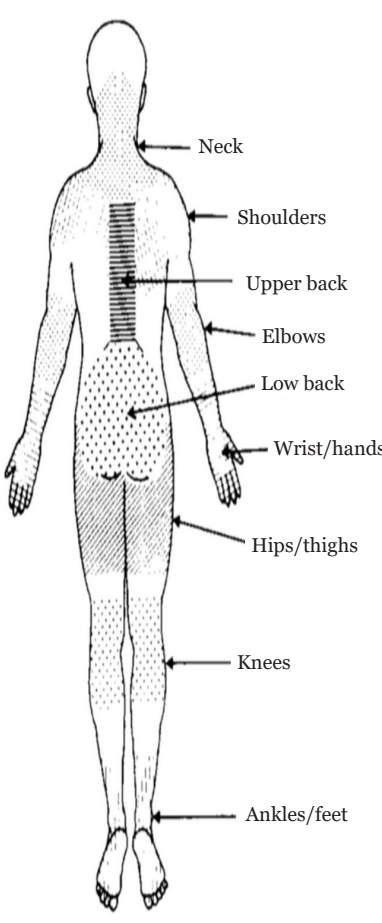
	Trouble with the locomotive organs		
	Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in:	To be answered only by those who have had trouble	
		Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?	Have you any trouble at any time during the last 7 days?
	Neck 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
	Shoulders 1. No 2. Yes, in the right shoulder 3. Yes, in the left shoulder 4. Yes, in both shoulders	1. No 2. Yes	1. No 2. Yes
	Elbows 1. No 2. Yes, in the right elbow 3. Yes, in the left elbow 4. Yes, in both elbows	1. No 2. Yes	1. No 2. Yes
	Wrist/hands 1. No 2. Yes, in the right wrist/hands 3. Yes, in the left wrist/hands 4. Yes, in both wrist/hands	1. No 2. Yes	1. No 2. Yes
	Upper back 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
	Low back (small of the back) 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
	One or both hips/thighs 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
	One or both knees 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes
	One or both ankles/feet 1. No 2. Yes	1. No 2. Yes	1. No 2. Yes

Figure 1 Original Version of Nordic Musculoskeletal Questionnaire (NMQ)

and another by English language expert from Language Laboratory. After going through the analysis/review of content aspects and grammar, three separate translations produced to one single Indonesian version. The final results of the NMQ simplification and translation into Indonesian is in Figure 2.

As shown in Table 2, the mean of the total NMQ score was 15.94 (± 8.17). The highest score is from 9th item on "Bottom" (1.62), 8th item on "Buttock" (1.58) and item number 0 on "upper neck" (0.86). The lowest score is from 13th item on the "Right lower arm" (0.12), 7th item on "Waist" (0.14) and 12th item on "Left lower arm" (0.16). The most significant variance observed in item 7 "Waist" (1.266), item 9 "Bottom" (1.138), and item 5 "Back" (1.102); while the smallest variance observed in item 12 "Left lower arm" (0.21). The smallest Pearson correlation is from item number

12 on "Left lower arm" (0.501), item number 10 on "Left elbow" (0.503), and item number 3 on "Right shoulder" (0.510). The highest Pearson correlation is from item number 8 on "Buttock" (0.823), item number 7 on "Waist" (0.752), and item number 5 on "Back" (0.689).

As shown in Table 2 and Figure 1, the Cronbach's alpha as an internal consistency range from 0.707 (lowest) to 0.728 (highest). There are several alternatives to increase the Cronbach's alpha coefficient. With question number 8 "Buttock" deleted this can increase Cronbach's alpha coefficient by 0.726. If question number 10 "Body region of the left elbow" deleted this can increase Cronbach's alpha coefficient by 0.727 and if item question number 11 "Body region of the right elbow" deleted this can increase Cronbach's alpha coefficient by 0.728. However, in general, the combination of all 28 items/

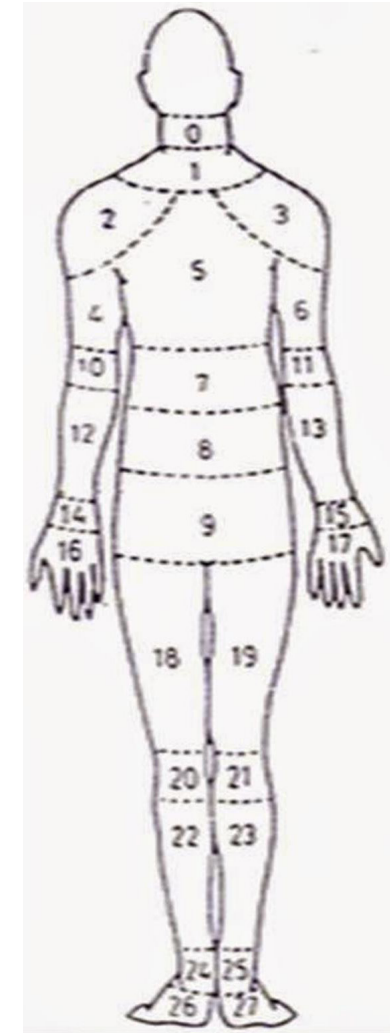
Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in: (Dalam 12 bulan terakhir ini, apakah anda merasakan nyeri, sakit atau tidak nyaman pada bagian-bagian tubuh di bawah ini):		Answer (<i>Jawaban</i>)				
		A	B	C	D	
		0	1	2	3	
	0	Upper neck (<i>Leher atas</i>)				
	1	Lower neck (<i>Leher bawah</i>)				
	2	Left shoulder (<i>Bahu kiri</i>)				
	3	Right shoulder (<i>Bahu kanan</i>)				
	4	Left upper arm (<i>Lengan atas kiri</i>)				
	5	Back (<i>Punggung</i>)				
	6	Right upper arm (<i>Lengan atas kanan</i>)				
	7	Waist (<i>Pinggang</i>)				
	8	Buttock (<i>Pantat atas</i>)				
	9	Bottom (<i>Pantat bawah</i>)				
	10	Left elbow (<i>Siku kiri</i>)				
	11	Right elbow (<i>Siku kanan</i>)				
	12	Left lower arm (<i>Lengan bawah kiri</i>)				
	13	Right lower arm (<i>Lengan bawah kanan</i>)				
	14	Left wrist (<i>Pergelangan tangan kiri</i>)				
	15	Right wrist (<i>Pergelangan tangan kanan</i>)				
	16	Left hand (<i>Tangan kiri</i>)				
	17	Right hand (<i>Tangan kanan</i>)				
	18	Left thigh (<i>Paha kiri</i>)				
	19	Right thigh (<i>Paha kanan</i>)				
	20	Left knee (<i>Lutut kiri</i>)				
	21	Right knee (<i>Lutut kanan</i>)				
	22	Left calf (<i>Betis kiri</i>)				
	23	Right calf (<i>Betis kanan</i>)				
	24	Left ankle (<i>Pergelangan kaki kiri</i>)				
	25	Right ankle (<i>Pergelangan kaki kanan</i>)				
	26	Left foot (<i>Kaki kiri</i>)				
27	Right foot (<i>Kaki kanan</i>)					

Figure 2 Simplification of the NMQ and Translation into Indonesian Version

body region showed the highest reliability with Cronbach's alpha coefficient of 0.726 (Figure 3). This result generally shows that the Indonesian version of NMQ is reliable to measure MSD.

Based on Table 2 and the previous criteria, the results of the Pearson correlation showed the item number 7 and 8 declared are "excellent" because Pearson correlation (r) more than 0.75, and item number 0, 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 declare are "good" because Pearson correlation (r) ranged from 0.5 to 0.7.

In general, all of the questions are valid to

measure MSD in traditional women weavers.

Discussion

The questionnaire, as one of the measuring instruments, must be valid and reliable. Validity measured what is intended to be measured, explains how well the collected data covers the actual area of investigation, and expresses the degree to which a measurement measures what it purports to measure. Reliability concerns the extent to which a measurement of a phenomenon provides stable and consist result, and also

Table 2 Descriptive Characteristics, Cronbach's Alpha Reliability, and the Pearson Correlation of Each Data for Internal Consistency of Indonesian Version of the NMQ (n=50)

Item/Body Region	Mean	SD	Variance	r	p Value	Corrected Item/Total Correlation	Cronbach's Alpha if Item Deleted
Item 0	0.86	0.948	0.898	0.576	0.007	0.153	0.724
Item 1	0.74	0.899	0.809	0.573	0.055	0.383	0.718
Item 2	0.66	0.772	0.596	0.542	0.032	0.355	0.718
Item 3	0.66	0.717	0.515	0.510	0.010	0.351	0.719
Item 4	0.46	0.762	0.580	0.570	0.058	0.444	0.716
Item 5	0.80	1.050	1.102	0.689	0.000	0.487	0.713
Item 6	0.40	0.782	0.612	0.535	0.031	0.404	0.717
Item 7	0.14	1.125	1.266	0.752	0.000	0.570	0.710
Item 8	1.58	0.971	0.942	0.832	0.000	0.093	0.726
Item 9	1.62	1.067	1.138	0.619	0.024	0.494	0.713
Item 10	0.26	0.751	0.564	0.503	0.015	0.007	0.727
Item 11	0.18	0.560	0.314	0.517	0.022	-0.041	0.728
Item 12	0.16	0.468	0.219	0.501	0.016	0.534	0.715
Item 13	0.12	0.328	0.108	0.586	0.006	0.561	0.714
Item 14	0.28	0.607	0.369	0.664	0.001	0.368	0.720
Item 15	0.18	0.482	0.232	0.577	0.007	0.439	0.719
Item 16	0.52	0.839	0.704	0.521	0.023	0.290	0.721
Item 17	0.40	0.670	0.449	0.635	0.002	0.326	0.721
Item 18	0.58	0.785	0.616	0.615	0.003	0.571	0.712
Item 19	0.54	0.762	0.580	0.563	0.056	0.573	0.712
Item 20	0.52	0.814	0.663	0.530	0.012	0.233	0.723
Item 21	0.48	0.789	0.662	0.680	0.000	0.232	0.723
Item 22	0.66	0.848	0.719	0.659	0.001	0.683	0.707
Item 23	0.56	0.787	0.619	0.662	0.001	0.689	0.707
Item 24	0.36	0.563	0.317	0.661	0.001	0.286	0.725
Item 25	0.32	0.471	0.222	0.697	0.000	0.238	0.724
Item 26	0.46	0.706	0.498	0.690	0.000	0.524	0.715
Item 27	0.44	0.675	0.456	0.699	0.000	0.530	0.715
Total score	15.94	8.17	66.751	1	-	1.000	0.834

the degree to which the results obtained by measurement and the procedure can be replicated.^{21,22}

The finding indicates that the NMQ in Indonesian version has satisfactory psychometric properties with adequate validity and reliability. It can be used to measure MSD on traditional women weavers. Similar to this study, several efforts translating NMQ into other language is Legault et al.¹⁰ concluded that the French adapted version of the NMQ-E is an appropriate self-administered musculoskeletal symptom screening tool for the adolescent population. Arsalani et al.²³ concluded that adaptation of the NMQ in Iranian version has an acceptable conceptual structure and provides reliable information to measure health condition

(MSD) in Iranian nursing personnel. Mesquita et al.¹⁴ concluded the Portuguese version of the standardized Nordic musculoskeletal questionnaire seems to be valid and revealing good coefficients of reliability to measure MSD in food distribution workers in Portuguese. de Barros and Alexandre²⁴ concluded that the Brazilian version of the standardized Nordic questionnaire has a firm agreement and substantial reliability. Kahraman et al.¹⁶ argued the Turkish version of the NMQ has appropriate psychometric properties, including good test-retest reliability, internal consistency and construct validity, and can be used for screening and epidemiological investigations of musculoskeletal symptoms. Alaca²⁵ stated that the Turkish version of the

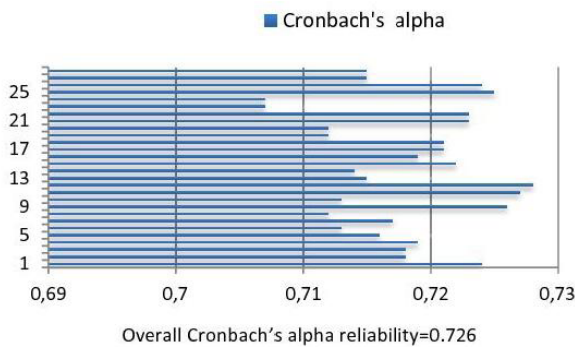


Figure 3 Result of Overall Cronbach's Alpha Reliability Test

NMQ-E showed adequate internal consistency (Cronbach coefficient $\alpha=0.78$).

Conclusion

The study demonstrates that translating of the NMQ into the Indonesian language fulfills the criteria of a reliable and valid assessment tool to rate the MSD. The high internal consistency and construct validity support the application of the NMQ as an easily administered tool to assess MSD in the Indonesian setting.

Conflict of Interest

The author declare no conflict of interest.

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