Cross-Sectional Study

Validity and Reliability of the Japanese Version of the Örebro Musculoskeletal Pain Screening Questionnaire-Short Form for Chronic Low Back Pain

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Background: Identifying patients at risk of developing persistent musculoskeletal pain problems with psychosocial aspects is crucial for targeted interventions. The Örebro Musculoskeletal Pain Screening Questionnaire-Short Form (ÖMPSQ-SF) is a valid screening instrument that is widely used for this purpose.

Objectives: The aim of this study was to assess the validity and reliability of the Japanese version of the ÖMPSQ-SF.

Study Design: Cross-sectional study.

Setting: A Japanese population of voluntary patients in a web-based survey.

Methods: A sample of 262 individuals with chronic low back pain was included to assess the internal consistency and concurrent validity of the Japanese questionnaire. Internal consistency was evaluated by calculating Cronbach's alpha coefficients. Concurrent validity was assessed using the short form of the Short-Form McGill Pain Questionnaire, Tampa Scale for Kinesiophobia, Pain Catastrophizing Scale, Pain Disability Assessment Scale, and Patient Health Questionnaire 2 items. Forty-one patients were asked to complete the ÖMPSQ-SF twice, a week apart, to evaluate test-retest reliability. Reliability was evaluated by calculating the intraclass correlation coefficient (ICC).

Results: The Cronbach's alpha coefficient and ICC for the ÖMPSQ-SF total score were 0.71 and 0.77, respectively, indicating acceptable internal consistency and reliability. The concurrent validity results showed moderate-to-strong correlations between the ÖMPSQ-SF and other reference questionnaires (r = 0.38-0.65). The ÖMPSQ-SF domains on pain intensity, function, distress, fear-avoidance beliefs, and expectations showed the highest correlations with their counterpart standard questionnaires.

Limitations: Our study included only individuals with chronic low back pain.

Conclusions: The Japanese version of the ÖMPSQ-SF showed acceptable psychometric properties in Japanese adults with chronic low back pain, supporting its use in clinical and research settings.

Key words: Örebro Musculoskeletal Pain Screening Questionnaire, low back pain, validity, reliability, psychometric properties, screening, Japanese, short form

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Low back pain is an extremely common health problem worldwide (1), and it imposes a substantial societal burden in terms of medical/pharmaceutical costs and loss of work productivity (2). Prevention of disability due to low back pain requires accurate identification of at-risk patients. Several clinical guidelines for low back pain recommend early assessment of prognostic factors for poor outcomes (e.g., chronicity) (3,4). Most of the important factors for the chronicity of low back pain have been recognized to be psychosocial factors, such as anxiety, depression, pain-related fear (referred to as fear-avoidance beliefs), job satisfaction, and expectation for recovery (5,6). Various instruments for assessing each of these factors have been developed; however, as the number of questionnaires increases, the time required to respond to them and the resultant patient burden also increases. Therefore, a brief screening tool is required to provide appropriate interventions in clinical settings.

The Örebro Musculoskeletal Pain Screening Questionnaire (ÖMPSQ) is a widely used instrument for screening patients with an increased likelihood of delayed recovery through the comprehensive assessment of key psychosocial factors (7). The questionnaire was developed to assist health care providers in identifying patients at risk of developing persistent musculoskeletal problems in a variety of primary care settings. This multifaceted questionnaire consists of 25 items that include several domains, such as pain experience, self-perceived physical functioning, psychological distress, fear-avoidance beliefs, return to work expectancy, and job satisfaction. The ÖMPSQ has been shown to predict future sick leave and persistent disability in individuals with musculoskeletal symptoms (8-10). It has been recommended in many clinical low back pain guidelines as a standardized screening tool to assess the increased risk of chronic pain and prolonged disability (11-13).

The short version of the ÖMPSQ (ÖMPSQ-SF) has also been developed, which consists of 10 items that are selected from the full version of the ÖMPSQ (14). The ÖMPSQ-SF includes 5 domains: pain, self-perceived function, psychological distress, expectation for improvement, and fear-avoidance beliefs. The ÖMPSQ-SF has been shown to predict individuals' developing disability nearly as well as the full version (14,15), and can be utilized in clinical and research settings. In conditions involving screening instead of a detailed assessment for the risk factors of chronic-

ity, the short version may have great utility because it allows for brief screening and requires less time to respond relative to the full version.

The ÖMPSQ has been translated into various languages, and the psychometric properties of these versions have been tested (16-21). To make the ÖMPSQ available in Japan, we previously translated the original English version into Japanese and validated it linguistically in accordance with international guidelines (22). However, the psychometric properties of the translated version have not been assessed. In this study, as a next step, we aimed to evaluate the validity and reliability of the Japanese version of the ÖMPSQ-SF in people with low back pain.

METHODS

Study Population

We conducted a web-based survey to assess the psychometric properties of the ÖMPSQ-SF among Japanese adults through a large Internet research company, Rakuten Insight, Inc (Tokyo, Japan), in which approximately 2.2 million panelists voluntarily registered. The invitation email was sent to 6,250 candidates after random sampling from panelists with low back pain (n = 12.521) by using a computer algorithm on October 16, 2020. Of the 2,500 respondents, 262, who met the following criteria, were selected: 1) aged 20-64 years, 2) regular (full-time), part-time, and temporary workers, and 3) having low back pain lasting ≥ 3 months (based on a question on pain duration in the ÖMPSQ-SF). For the second survey to assess test-retest reliability, 41 patients were selected from 262 patients with chronic low back pain by random sampling using a computer algorithm. They were asked to complete secondary questionnaires one week after the initial survey (Fig. 1). Before responding to the online self-report questionnaire, all patients provided a web-based informed consent form. The study protocol was approved by the Ethics Committee of our university (approval no 2020175).

Measures

We collected demographic information on age, gender, marital status, educational attainment, and job style. Patients were asked to select the following 3 options for their job style: white-collar (i.e., work mostly at a desk), interpersonal service (e.g., sales clerk, service), and blue-collar (i.e., work mostly with physical loads).

Örebro Musculoskeletal Pain Screening Questionnaire-Short Form

The cross-cultural adaptation of the Japanese version of the ÖMPSQ has been described previously in detail (22). The ÖMPSQ-SF is a self-administered instrument containing 10 items that are selected from 25 items of the original version (14). The questionnaire covers 5 domains: pain (duration, intensity; 2 items), self-perceived function (2 items), distress (anxiety, depression; 2 items), expectancy for improvement (2 items), and fear-avoidance beliefs (2 items). Each item is scored on a Numeric Rating Scale (NRS-11) (range: 0-10). Only the item on pain duration has 10 categories (1-10 scale) ranging from 0-1 week to more than 1 year. Scores for self-perceived function (2 items) and expectancy

Approximately 2.2 million panelists registered with the internet research company

Panelists with low back pain
n = 12,521

Random sampling by a computer algorithm

Candidates with low back pain
n = 6,250

Invitation to the first survey

Respondents with low back pain
n = 2,500

Inclusion criteria
· aged 20–64 years
· workers
· having low back pain lasting ≥ 3 months

Participants with chronic low back pain
262 workers aged 20–64 years

Invitation to the second survey
7 days after the first invitation

Random sampling by a computer algorithm

Participants in second survey
with chronic low back pain
41 workers aged 20–64 years

Fig. 1. *Flow diagram showing the inclusion of study patients in the analysis.*

for improvement (only 1 item) were reversed (i.e., by subtracting selected score from 10) in line with the original literature (14). The score for each item was summed to obtain a total score, with a maximum possible score of 100. Higher scores indicated a greater risk of developing chronic pain-related disabilities. The Japanese version of the ÖMPSQ-SF can be found in Appendix 1.

Short-Form McGill Pain Questionnaire-Revised

We used the revised version of the Short-Form McGill Pain Questionnaire (SF-MPQ-2). The questionnaire was translated into Japanese according to the established linguistic validation guidelines (23). The SF-MPQ-2 consists of 22 items that describe various kinds of pain and related symptoms, where each item is rated on an 11-point NRS-11 (0: none, 10: worst possible). The total score is calculated by summing the scores of all items (range: 0-220), with higher scores indicating more severe pain conditions.
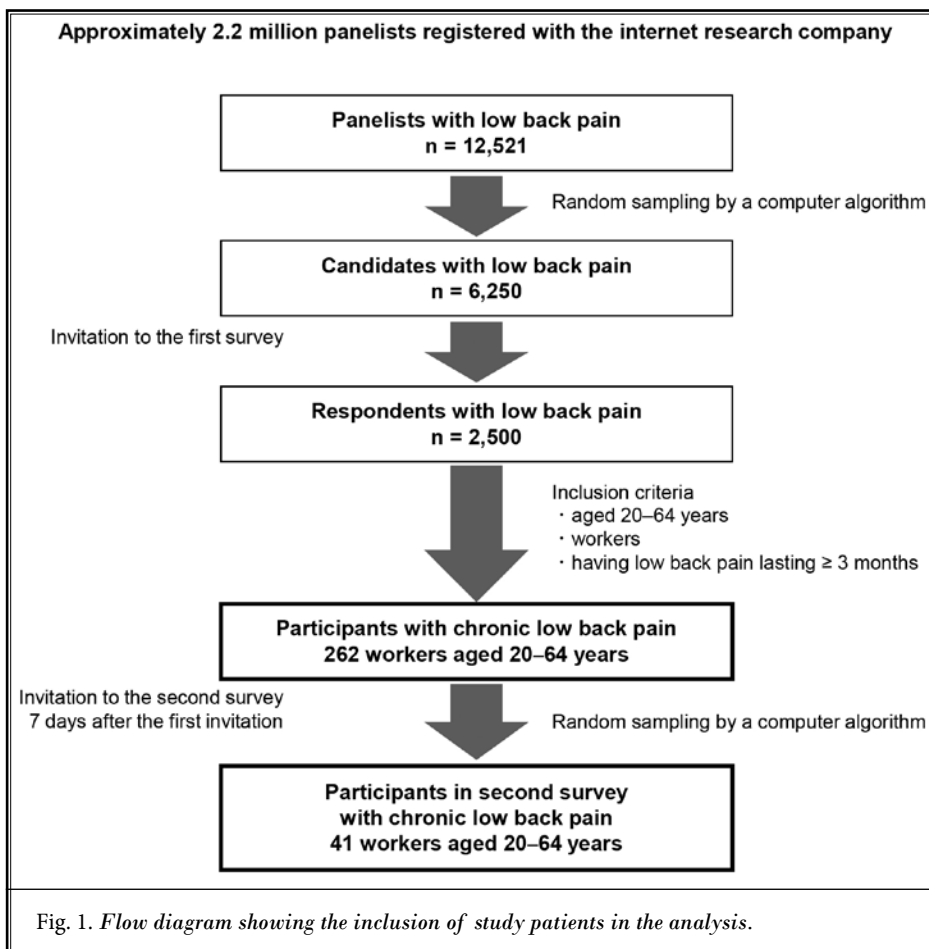
Tampa Scale for Kinesiophobia-Short Form

We used the short form of the Tampa Scale for Kinesiophobia (TSK-11). The Japanese version of the TSK-11 has been previously confirmed to have good psychometric properties (24). The questionnaire consists of 11 items that measure the degree of fear of movement/(re)injury. Respondents were asked to rate each item on a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree). The total score ranges from 11 to 44, with higher scores indicating a greater degree of fear of movement or (re)injury.

Pain Catastrophizing Scale

The Pain Catastrophizing Scale (PCS) is a 13-item, self-reported questionnaire that asks respondents to indicate the extent to which they experienced different pain-related thoughts and feelings (25). Each item is rated on a 5-point scale from 0 (not at all) to 4 (all the time). The total score ranges from 0 to 52, with

higher scores reflecting higher levels of catastrophizing thoughts.

Pain Disability Assessment Scale

We assessed pain-related disability using the Pain Disability Assessment Scale (PDAS) (26). The PDAS consists of 20 items related to daily activities. Respondents indicated the degree to which their pain interfered with each activity during the past 1 week on a 4-point NRS-11 (0: pain did not interfere with this activity, 3: pain interfered completely with this activity). Total scores range from 0 to 60, with higher scores reflecting a higher degree of pain-related disability.

Patient Health Questionnaire-2

Psychological distress was evaluated using the Patient Health Questionnaire-2 (PHQ-2). The PHQ-2 was developed as a brief screening tool for depression, and it consists of 2 questions from the original Patient Health Questionnaire-9 (27). This instrument assesses the frequency of depressed mood and anhedonia within the past 2 weeks. Each item has a binary response (1: yes, 0: no) (28), with the total possible scores ranging from 0 to 2.

Sample Size Estimation

In this study, we considered a sample size of at least 100 patients adequate to determine the internal consistency according to a previous study (29) on a proposal for measurement properties of health-related questionnaires. The required sample size for the test-retest reliability was determined with the following assumption: the value of intraclass correlation coefficient (ICC) under the null hypothesis was 0.70, and the value of ICC under the alternative hypothesis was 0.90. With a significance level of 0.05 and a power of 0.80, the minimum sample size needed was 19 (30). Our study sample for test-retest reliability was sufficient to meet the required sample size.

Statistical Analysis

To determine the concurrent validity of the ÖMPSQ-SF, we assessed the correlation of the total and subscores of the ÖMPSQ with other standard questionnaires (SF-MPQ-2, TSK-11, PCS, PDAS, and PHQ-2) by using Pearson correlation coefficients (r). The correlation coefficients were considered as follows: 0.10-0.29 (weak), 0.30-0.49 (moderate), and $\geq$ 0.50 (strong) (31).

Reliability was evaluated using internal consistency and test-retest reliability. We assessed the internal consistency of the ÖMPSQ-SF by using Cronbach's alpha values. Alpha values > 0.7 are usually considered to indicate acceptable internal consistency (29). We evaluated the test-retest reliability using ICC in individuals with chronic low back pain who responded to the questionnaire twice 1 week apart. The possible ICC values ranged from 0.0 to 1.0, with values of $\geq$ 0.7 indicating satisfactory reliability (29).

SPSS Version 24 (IBM Corporation, Armonk, New York, United States) was used to calculate the ICC coefficient using a one-way random effect model. Other statistical data were analyzed using SAS Version 9.4 (SAS Institute Inc., Cary, NC, United States). Statistical significance was set at $P < 0.05$ (2-tailed).

Results

Data from 262 individuals with chronic low back pain were analyzed to assess the validity and internal consistency. The mean age was 51.6 years (standard deviation (SD), 8.0 years), and 76.7% of the patients were men. More than half of the patients were white-collar workers (Table 1). The mean total ÖMPSQ-SF score was 47.8, and most of the patients (88.9%) had chronic low back pain that lasted more than a year (Table 2).

To determine the reliability of the Japanese ÖMPSQ-SF, we evaluated internal consistency using Cronbach's alpha coefficients values. The Cronbach's alpha coefficient for the Japanese ÖMPSQ-SF was 0.71, indicating acceptable internal consistency.

To evaluate concurrent validity, we calculated the Pearson correlation coefficients for the relationship between the total score of the ÖMPSQ-SF and other standardized questionnaires (Table 3). The total score of the ÖMPSQ-SF showed strong correlations with the scores of TSK-11, PCS, and PDAS (r = 0.56-0.65, $P < 0.001$ for all comparisons), while the SF-MPQ-2 and PHQ-2 scores were moderately correlated with the ÖMPSQ-SF total score (r = 0.38–0.49, $P < 0.001$ in both) (Table 3).

We also assessed the relationship between the scores of the ÖMPSQ-SF domains and the scores of other questionnaires (Table 3). The pain intensity domain of the ÖMPSQ-SF was moderately correlated with the SF-MPQ-2 (r = 0.48). The function domain of the ÖMPSQ-SF was moderately correlated with the PDAS (r = 0.49). The psychological distress domain of the ÖMPSQ-SF showed moderate-to-strong correlations with the PCS and PHQ-2 (r = 0.50 and 0.48, respectively). There was a moderate correlation between the expectation domain of the ÖMPSQ-SF and PCS (r = 0.46). The fear-avoidance

Table 1. *Demographic characteristics of the study patients (n = 262).*

	n	%
Age (y)		
20-29	2	0.8
30-39	19	7.3
40-49	84	32.1
50-59	112	42.7
60-65	45	17.2
Gender		
Men	201	76.7
Women	61	23.3
Marital Status		
Married	184	70.2
Single	47	17.9
Divorced	24	9.2
Widowed	7	2.7
Educational Attainment		
Less Than High School	7	2.7
High School	51	19.5
Vocational School	35	13.4
Junior College	19	7.3
College of Technology	4	1.5
University	131	50.0
Graduate School	15	5.7
Job Style		
White-collar	136	51.9
Interpersonal Service	46	17.6
Blue-collar	80	30.5

Table 2. *Scores of the ÖMPSQ and reference questionnaires.*

	Mean	SD
ÖMPSQ Total (0-100)	47.8	12.5
ÖMPSQ Domains		
Item 1: Pain Duration, n (%)		
3-6 months	13	5.0
6-9 months	11	4.2
9-12 months	5	1.9
1 year or more	233	88.9
Item 2: Pain Intensity (0-10)	4.7	1.9
Item 3 + Item 4: Function (0-20)	5.8	4.2
Item 5 + Item 6: Distress (0-20)	8.9	4.5
Item 7 + Item 8: Expectation (0-20)	9.0	2.8
Item 9 + Item 10: Fear-Avoidance (0-20)	9.7	5.3
Scores of Reference Questionnaires		
SF-MPQ-2 (0-220)	39.6	35.1
PDAS (0-60)	13.2	8.8
PCS (0-52)	25.0	10.8
PHQ-2 (0-2)	0.5	0.8
TSK-11 (11-44)	26.7	6.8

Abbreviations: ÖMPSQ, Örebro Musculoskeletal Pain Screening Questionnaire; PCS, Pain Catastrophizing Scale; PDAS, Pain Disability Assessment Scale; PHQ-2, Patient Health Questionnaire-2; SD, standard deviation; SF-MPQ-2, revised Short-Form McGill Pain Questionnaire; TSK-11, Tampa Scale for Kinesiophobia 11-item. Values represent mean (SD), except where indicated n (%).

domain of the ÖMPSQ-SF was moderately correlated with the TSK-11 (r = 0.37) (Table 3).

Data from 41 patients with chronic low back pain were analyzed to evaluate the test-retest reliability. The ICC (95% confidence interval) for the ÖMPSQ-SF was 0.77 (0.57-0.88), which indicated good reliability.

Discussion

This is the first study to assess the psychometric properties of the Japanese version of the ÖMPSQ-SF in people with chronic low back pain. The results showed that the Japanese version had satisfactory concurrent validity, acceptable internal consistency, and good reliability. Thus, our study supports the use of the ÖMPSQ-SF in clinical and research settings in Japan.

We evaluated the correlation of the ÖMPSQ-SF with other validated questionnaires related to pain assessment. The total score of the ÖMPSQ-SF showed moderate-to-strong correlations with reference questionnaires, including those evaluating multidimensional pain (SF-MPQ-2), pain-related fear (TSK-11), catastrophizing (PCS), disability (PDAS), and depressive symptoms (PHQ-2). Our results were consistent with previous studies (17,32) using translated versions of the ÖMPSQ-SF (r = 0.34–0.69). Moreover, our study found that all domains of the ÖMPSQ-SF, except for pain duration, showed a moderate correlation with the relevant reference questionnaires. Only the domain of pain duration was not significantly correlated with any of the questionnaires, which may be because most of the study patients (88.9%) had a pain duration of more than one year. In the German version of the ÖMPSQ-SF, the ÖMPSQ-SF subscales for self-perceived function, distress, and fear-avoidance beliefs correlated highest with the respective counterpart scales among generic questionnaires (33). Our findings imply that the ÖMPSQ-SF might be useful not only to identify individuals at a high risk of chronicity of disability, but also to obtain brief information on psychosocial factors that may help treatment.

Table 3. *Correlations between ÖMPSQ and the reference questionnaires.*

	ÖMPSQ Total	ÖMPSQ Domains					
		Pain Duration	Pain Intensity	Function	Distress	Expectation	Fear-Avoidance
SF-MPQ-2	0.49***	-0.01	0.48***	0.39***	0.38***	0.34***	0.16**
PDAS	0.56***	0.10	0.37***	0.49***	0.40***	0.40***	0.22***
PCS	0.65***	0.07	0.36***	0.44***	0.50***	0.46 ***	0.36***
PHQ-2	0.38***	0.04	0.15*	0.24***	0.48***	0.24***	0.09
TSK-11	0.59***	-0.07	0.26***	0.40***	0.44***	0.41***	0.37***

Abbreviations: ÖMPSQ, Örebro Musculoskeletal Pain Screening Questionnaire; PCS, Pain Catastrophizing Scale; PDAS, Pain Disability Assessment Scale; PHQ-2, Patient Health Questionnaire-2; SF-MPQ-2, revised short form McGill Pain Questionnaire; TSK-11, Tampa Scale for Kinesiophobia 11-item.
n = 262; *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.
Values represent Pearson's correlation coefficients.

The Cronbach's alpha coefficient of the Japanese version of the ÖMPSQ-SF was 0.71, indicating acceptable internal consistency. Studies (17,32,33) on the psychometric properties of other translated versions of the ÖMPSQ-SF showed Cronbach's alpha values of 0.72-0.80, indicating that our results were reasonable. The Cronbach's alpha coefficient of the ÖMPSQ-SF seem lower than that of the long form of ÖMPSQ (0.81-0.97) in previous studies (16-20,34), which may partly be due to the number of questions asked.

In the assessment of test-retest reliability, the ICC value in our study was satisfactory, indicating good reliability. The ICC values of other translated versions of the ÖMPSQ-SF were 0.78 (17) or 0.868 (32). It may be difficult to directly compare our results with previous studies because of the differences in the methods of administration (i.e., (AU:?) interview or self-reported), inclusion criteria, and survey intervals at 2 different time points. Although there were slight differences with previous studies, our results indicated that the Japanese version of the ÖMPSQ-SF had good test-retest reliability (22).

Another globally used screening instrument that includes psychosocial factors is the Subgrouping for Targeted Treatment Back Screening Tool (SBST), which enables the risk of persistent back problems to be assessed briefly (35). A recent review indicated that using SBST or ÖMPSQ as a standard tool has been recommended in several clinical guidelines on low back pain to screen for increased risk of poor outcomes (13). ÖMPSQ-SF has been demonstrated to have a good correlation and moderate agreement with SBST in assessments of acute or subacute spinal pain (36,37). On the other hand, a review by Lheureux et al (38) compared the predictive power of SBST and ÖMPSQ according to the type of outcome. This review recommended the use of the ÖMPSQ-SF for prognosing "work" outcomes, such as sick leave. A previous study (14) suggested a cutoff value of 50 for the ÖMPSQ-SF to identify those at risk for long-term sick leave. Thus, the ÖMPSQ-SF, which is not specific to low back pain, but can be used for a variety of forms of musculoskeletal pain, might be useful to screen for increased risk of work disability in workers with musculoskeletal pain.

Our study had some limitations. First, the patients in our survey may not be representative of the Japanese population because of the selection without consideration of population distribution and the potential selection bias in the Internet survey. Second, we evaluated the psychometric properties of the Japanese version of the ÖMPSQ-SF among people with chronic low back pain, who were the most common patients in previous studies (15,18) on the validation of the ÖMPSQ. However, as has been done with the original questionnaire, there is a need to validate the ÖMPSQ-SF in a wide range of patients, including those with other musculoskeletal pain, such as neck pain. In addition, further studies with patients at risk for disability due to low back pain (e.g., manual work, poor job satisfaction, or lower educational status) are also needed. Such a process could expand the clinical utility of the Japanese version of the ÖMPSQ-SF.

Conclusions

In this study, the Japanese version of the ÖMPSQ-SF was shown to be a valid and reliable questionnaire to evaluate multidimensional aspects related to the poor outcomes of musculoskeletal pain in a Japanese population with chronic low back pain. To facilitate the clinical use of the questionnaire, further research is needed to assess the predictive ability of work disability in the Japanese population with various types of musculoskeletal pain.

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