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ORIGINAL ARTICLE

Predictive ability of a modified Örebro Musculoskeletal Pain Questionnaire in an acute/subacute low back pain working population

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Abstract The original 'Örebro Musculoskeletal Pain Questionnaire' (original-ÖMPQ) has been shown to have limitations in practicality, factor structure, face and content validity. This study addressed these concerns by modifying its content producing the 'Örebro Musculoskeletal *Screening* Questionnaire' (ÖMSQ). The ÖMSQ and original-ÖMPQ were tested concurrently in acute/subacute low back pain working populations (pilot $n = 44$, main $n = 106$). The ÖMSQ showed improved face and content validity, which broadened potential application, and improved practicality with two-thirds less missing responses. High reliability (0.975, $p < 0.05$, ICC: 2.1), criterion validity (Spearman's $r = 0.97$) and internal consistency ($\alpha = 0.84$) were achieved, as were predictive ability cut-off scores from ROC curves (112–120 ÖMSQ-points), statistically different ÖMSQ scores ($p < 0.001$) for each outcome trait, and a strong correlation with recovery time (Spearman's, $r = 0.71$). The six-component factor structure reflected the constructs originally proposed. The ÖMSQ can be substituted for the original-ÖMPQ in this population. Further research will assess its applicability in broader populations.

Keywords Low back pain · Prognosis · Screening · Questionnaire · Validation

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Introduction

Low back pain (LBP) is the source of considerable financial and societal costs [23]. Its natural course is argued as either self-limiting, where 3–10% become chronic [2], or recurrent [34] and unfavourable [19], where up to 62% still experience pain after 1 year [18]. The majority of LBP costs arise from patients that transition from acute to chronic [11], with early identification critical [32] and psychosocial factors [14, 24] identified as significant contributors [3, 27, 35] along with baseline functional status [15, 35]. Eight LBP screening instruments have been published using psychosocial and physical prognostic factors [32]. The original Örebro Musculoskeletal Pain Questionnaire (original-ÖMPQ) [28] is among the most investigated [32] and widely used [12, 16, 17, 22, 31, 39]. Furthermore, it is recommended in clinical guidelines, particularly for workers under compensation insurance [21, 36] and recognised as effective in predicting

absenteeism [25, 28, 29, 31, 37, 39], chronicity [9, 17, 25], pain [12, 13, 28] and impairment [13, 21, 22].

The original-ÖMPQ has 25 questions but only 21 are scored (0–10-point response scale). These are built around five proposed constructs [29]: function, pain, psychological, fear-avoidance and miscellaneous. It was derived from the 'Acute Low Back Pain Screening Questionnaire' (ALBPSQ) [26] by removing the word 'back' and adding further body areas to question #1 [28]. Cut-off ranges in ÖMPQ-points are used to indicate low (90–100) [20, 28] and high (105–119) [20, 22] risk of prolonged recovery from LBP.

Despite its widespread endorsement, several limitations in the original-ÖMPQ have been identified: lack of rigorous development [9, 22], non-validated modifications [4, 30, 31], inconsistent wording [20, 22], inconsistent factor structure [13, 39], reduced practicality [4, 20] and lack of independent validation [12, 21]. Only 7 of 17 published studies based on the ALBPSQ and original-ÖMPQ, limited to 13 data sets (10 on LBP), have reported validation [9, 12, 17, 28, 29, 33, 37]. The impact of these limitations on response accuracy [12, 13, 22], cut-off values [20, 21, 25] and predictive ability [21, 30, 31] has not been reported.

Both a recent systematic review [21] and a cross-cultural study [30] recommended further research on the predictive ability of modified versions of the original-ÖMPQ, and an assessment of their usefulness in different populations. Modifications that improve scope through changes to face and content validity, must not sacrifice the critical psychometric, practical or predictive characteristics. They must also be validated concurrently with the original-ÖMPQ within the target working population of acute/subacute LBP prior to testing within broader musculoskeletal populations.

Consequently, this study aimed to: (1) address limitations in the original-ÖMPQ through modifications that produced the 'Örebro Musculoskeletal Screening Questionnaire' (ÖMSQ; Fig. 1); and (2) concurrently evaluate the ÖMSQ and original-ÖMPQ (screening questionnaires) critical characteristics in the target acute/subacute LBP working population.

Materials and methods

Design

A two-phase prospective, observational study was conducted involving ÖMSQ development, followed by validation (Appendix 1).

Phase 1: ÖMSQ development

Potential limitations in the original-ÖMPQ face and content validity were explored qualitatively in two ways. Firstly, through consensus opinion by members of an 'expert advisory panel' (comprised of an occupational therapist, physical therapist, occupational physician and senior compensation manager). Secondly, from four interview-based 'five-patient focus-groups' (where groups 1–2 had 'LBP', one work-related, the other not; and groups 3–4 had 'other symptoms', one work-related, the other not). Analysis of this feedback enabled modifications to be incorporated into the ÖMSQ.

Face validity A standardised self-administered questionnaire on a five-point (0–4) numerical rating scale (NRS) was used to evaluate item accuracy, comprehensiveness and ease of response. Members of both the panel and focus-groups agreed that face validity was present and 'screening', rather than 'pain', was the primary purpose. Therefore, the questionnaire title was changed to the 'Örebro Musculoskeletal *Screening* Questionnaire (ÖMSQ)'.

Content validity To assess the content validity, the advisory panel identified 140 items sourced from the 14 articles used to develop the ALBPSQ [26, 29] from which the original-ÖMPQ [26, 29] was derived. The criteria for identification included: clear description, the source references' measurement aim and target population, constructs measured and items selected [1].

These items were then organised within the four themes of the World Health Organisation's International Classification of Functioning (WHO-ICF) [40], 'psychological', 'physical', 'personal' and 'other'. They were classified within six constructs, the five originally proposed by Linton and Hallden [18], namely, function, pain, psychological, fear-avoidance and miscellaneous, with the sixth construct, 'personal', added for WHO alignment. The construct 'Pain' was modified to 'pain/problem' in questions #5–7, #9–12, #15 and #18–25 to accommodate most musculoskeletal conditions [32].

Production of the ÖMSQ Four critical characteristics of the original-ÖMPQ were retained in the ÖMSQ, question number and order, scoring format and total score. This ensured continuity and substitution for potential users. The questions were renumbered #1–#21 and classified within the six aforementioned constructs (Fig. 1).

Phase 2: ÖMSQ validation

The screening questionnaires were pilot-tested concurrently in a 6-week trial ($n = 44$) followed by a 6-month study ($n = 106$). The pilot field-testing enabled feedback from clinicians and focus-group members on the ÖMSQ wording and grammar to be incorporated prior to the main study.

Örebro Musculoskeletal Screening Questionnaire (ÖMSQ)

(Modified from: Kendall et al. 1997, Linton and Boersma 2003 and Bergner et al. 1981)

NAME: _____ **Date:** ___/____/___ **Your Problem:** _____

Date of Birth: ___/____/___ **Date of Injury:** ___/____/___ **Date Stopped Work or Normal Routine:** ___/____/___

☐ **Male** ☐ **Female** **Problem Area (✓):** ☐ **Back** ☐ **Neck** ☐ **Arm** ☐ **Leg** ☐ **Other** _____

INSTRUCTIONS: These questions and statements apply to your problem. This may include aches, pains or problems in the affected area. It is important you respond to each question. Please read and answer each question carefully. However, do not take too long. Just respond as you feel. There is always an answer for your sit uation.

1. Where do you have your pain/problem? Place a tick (✓) for all the appropriate sites. **2 X Count**

☐ back or neck ☐ arm ☐ leg ☐ both sides ☐ several body areas [. .]

2. Due to your pain/problem, how many days of work or 'normal daily routine' have you missed? Tick (✓) one. [. .]

☐ 0 days [1] ☐ 1-2 days [2] ☐ 3-7 days [3] ☐ 8-14 days [4] ☐ 15-28 days [5]

☐ 1 month [6] ☐ 2 months [7] ☐ 3-6 months [8] ☐ 6-12 months [9] ☐ over 1 year [10]

3. How long have you had your current pain/problem? Tick (✓) one. [. .]

☐ 0-1 weeks [1] ☐ 1-2 weeks [2] ☐ 3-4 weeks [3] ☐ 4-5 weeks [4] ☐ 6-8 weeks [5]

☐ 9-11 weeks [6] ☐ 3-6 months [7] ☐ 6-9 months [8] ☐ 9-12 months [9] ☐ over 1 year [10]

4. Do you feel your work or normal daily routine is a burden to you (e.g. heavy or monotonous)? Circle one. [. .]

0 1 2 3 4 5 6 7 8 9 10

Not at all *Extremely*

5. How would you rate your pain/problem during the past week, or since the injury if less than a week ago? Circle one. [. .]

0 1 2 3 4 5 6 7 8 9 10

No pain/problem *Worst possible*

Since your injury (or in the past three months if it is not a recent injury), in general:

6. How has your pain/problem been? Circle one. [. .]

0 1 2 3 4 5 6 7 8 9 10

No pain/problem *Worst possible*

7. How often is your pain/problem present? Circle one. [. .]

0 1 2 3 4 5 6 7 8 9 10

Never *All the time*

Over the last week, or since the injury if it were less than a week ago, on an average day:

8. How well can you cope with or control your pain/problem? Circle one. **10-*x*** [. .]

0 1 2 3 4 5 6 7 8 9 10

Not at all *Completely*

9. How tense or anxious have you felt? Circle one. [. .]

0 1 2 3 4 5 6 7 8 9 10

Not at all *Extremely*

10. How depressed or 'down' have you felt? Circle one. [. .]

0 1 2 3 4 5 6 7 8 9 10

Not at all *Extremely*

Fig. 1 Örebro musculoskeletal screening questionnaire (ÖMSQ)

11. In your view, how large is the risk that your current pain/problem may become persistent? Circle one.

0 1 2 3 4 5 6 7 8 9 10 . .

No risk *Very large risk*

12. What are the chances you will be doing your work or normal daily routine in 6 months time? Circle one. **10-*x***

0 1 2 3 4 5 6 7 8 9 10 . .

No chance *Very large chance*

13. How satisfied are you with your current life situation (work/normal daily routine, home, friends)? Circle one. **10-*x***

0 1 2 3 4 5 6 7 8 9 10 . .

Not at all *Completely*

The following three (3) statements are what people have said about their pain/problem. For each statement, please circle ONE number from 0 to 10. This shows how much physical or normal daily activity (e.g. bending, lifting, carrying, walking, driving, travel, etc) affects your pain/problem.

14. Physical activity makes my pain/problem worse.

0 1 2 3 4 5 6 7 8 9 10 . .

Completely disagree *Completely agree*

15. An increase in my pain/problem tells me I should stop what I am doing until my pain/problem decreases.

0 1 2 3 4 5 6 7 8 9 10 . .

Completely disagree *Completely agree*

16. I should not do my work or normal daily routine with my present pain/problem.

0 1 2 3 4 5 6 7 8 9 10 . .

Completely disagree *Completely agree*

Here is a list of five (5) activities. Please circle the number that best describes your current ability to participate in each of these activities due to your pain/problem.

17. I can manage light work for up to an hour (e.g. lift, carry or move light objects <5kgs, 10lb). **10-*x***

0 1 2 3 4 5 6 7 8 9 10 . .

Not at all *Completely*

18. I can walk for an hour or participate in my normal light recreational or sporting activities. **10-*x***

0 1 2 3 4 5 6 7 8 9 10 . .

Not at all *Completely*

19. I can manage my regular home activities and chores (e.g. cleaning, steps, use a chair, family duties, etc). **10-*x***

0 1 2 3 4 5 6 7 8 9 10 . .

Not at all *Completely*

20. I can manage my regular daily routine and social activities (e.g. shopping, transport or seeing friends). **10-*x***

0 1 2 3 4 5 6 7 8 9 10 . .

Not at all *Completely*

21. I can sleep at night or move normally in bed. **10-*x***

0 1 2 3 4 5 6 7 8 9 10 . .

Not at all *Completely*

TOTAL . .

Fig. 1 continued

Participants and setting Patients were recruited consecutively from convenience samples in Australian physiotherapy outpatient clinics with existing treatment regimes noted. Pilot study participants were from four clinics in one state. Main study participants were from seven clinics in three states which expanded the geographic sample area (Table 1). The larger sample reduced by fourfold the proportion of chronic participants from 25% in the pilot to 6% in the main study which improved the representation of the intended acute/subacute sample. Patients with exacerbated pre-existing LBP (with symptoms present >12 weeks) were included and classified 'chronic'. Inclusion criteria were acute/subacute LBP, workers' compensation and medical practitioner referral. Exclusion criteria were pregnancy, red flag signs, <18 years and English comprehension difficulty.

Assessments Five patient-reported outcomes were used [5, 38] to determine predictive ability through dichotomised responses [7]. These assessed functional status [8, 10], problem severity [22, 28], absenteeism, long-term absenteeism (LTA) and recovery time [10] (Appendix 2).

All questionnaires were completed concurrently at baseline. Only 66 participants returned the original-ÖMPQ; all 106 returned the ÖMSQ. The spine functional index (SFI) and numeric rating scale (NRS) were repeated at two weekly intervals until discharged or study completion. Two assessors, the panel physiotherapist and occupational therapist, were blinded to the baseline screening scores which ensured independent collection of outcome data [21].

The psychometric and practical characteristics were investigated with the definitions of each characteristic and an explanation of the methodology detailed (Appendix 3).

Psychometric characteristics

Three psychometric characteristics were assessed within subgroups of the total sample. These were *test–retest reliability*, *concurrent criterion validity* and *predictive ability*. The remaining characteristics assessed from the full sample included *convergent and divergent validity, internal consistency* and *factor analysis*.

Practical characteristics

Readability was assessed using the Flesch-Kincaid grading scale. *Missing responses* were determined from all participant responses. *Completion and scoring times* were determined respectively from focus-group participants and the clinicians.

Sample size Minimum samples were determined from the pilot results for an 80% chance of detecting actual difference, allowing for 15% attrition ($p < 0.05$) for concurrent validity ($n = 61$), reliability ($n = 36$), predictive ability ($n = 48$) and pooled samples for internal consistency and factor analysis ($n > 100$) [7].

Statistical analyses were conducted using SPSS version 14.0 with significance set at $p < 0.05$.

Results

Phase 1: ÖMSQ development

Face validity

Recommended improvements in the original-ÖMPQ were identified in six critical areas, namely, *region, question continuity*, *symptom duration*, *activity terminology, function variables* and *constructs* (Appendix 4).

Content validity

The 140 identified items were reduced to 50 by the panel through removal of duplicates and redundancies. Through consensus within the panel and focus-group feedback, this was further reduced to the final 25 items. All 21 ALBPSQ items were included, with #8 renamed 'burdensome', and four additional ADLs combined within the physical

Table 1 Participant demographics

Study group	Number	Drop outs	Female (%)	Age/range (years)	Mean duration (weeks)	Multi-area (%)	Acute (%, duration in weeks)	Subacute (%, duration in weeks)	Chronic (%, duration in weeks)
Pilot	44	6 (of 44) (13.6%)	41	38 ± 9	7.3 ± 8.1	24	61	14	25
				18–54			2.3 ± 1.3	7.5 ± 2.3	19.5 ± 6.4
Main cohort	106 (ÖMSQ)	9 (of 106) (8.5%)	43	39 ± 9	4.1 ± 8.1	14	79	13	8
				18–58			1.1 ± 0.5	8.0 ± 1.9	25.5 ± 14.5
	66 (ÖMPQ)	8 (of 66) (12.1%)	42	39 ± 7	4.0 ± 8.2	13	80	14	6
				18–58			1.2 ± 0.6	8.1 ± 1.8	24.9 ± 13.8

Demographic values are given as mean ± SD if appropriate

Table 2 Predictive validity of ÖMSQ and original-ÖMPQ for the four outcomes (functional status, problem severity, absenteeism and long-term absenteeism)

Outcome	ÖMSQ				Original-ÖMPQ			
	Cut-off score	LR (Sens:Spec)	AUC for ROC	95% CI	Cut-off score	LR (Sens:Spec)	AUC for ROC	95% CI
Functional status (recovered <10%)	101	−20.16 0.720:0.964	0.12	0.78–0.99	100	−19.04 0.680:0.964	0.12	0.77–0.99
Functional status (not recovered ≥10%)	112	7.14 0.857:0.880	0.88	0.78–0.99	113	7.14 0.857:0.88	0.88	0.77–0.99
Problem severity (recovered ≤1)	101	−20.16 0.720:0.964	0.15	0.72–0.97	100	−19.04 0.680:0.964	0.16	0.71–0.97
Problem severity (not recovered >1)	112	5.13 0.821:0.840	0.85	0.72–0.97	113	5.13 0.821:0.840	0.84	0.71–0.97
No absenteeism (0 days)	95	−5.07 0.667:0.868	0.14	0.76–0.96	94	−5.57 0.733:0.868	0.13	0.77–0.96
Absenteeism (>0 days)	116	7.89 0.526:0.933	0.86	0.76–0.96	115	9.87 0.658:0.933	0.86	0.77–0.93
No long-term absenteeism (≤28 days)	110	−19.03 0.793:0.958	0.85	0.73–0.96	112	−19.03 0.793:0.958	0.85	0.73–0.97
Long-term absenteeism (>28 days)	120	4.53 0.625:0.862	0.15	0.73–0.96	120	5.64 0.583:.897	0.15	0.73–0.97

Cut-off score calculated from ROC curves maximum value, LR [Sensitivity/(1 − Specificity)], AUC, area under the curve ($p < 0.0001$, 95%, CI range) for the ROC

function questions (#22–25) (Appendix 1). This broadened application and improved respondent comprehension. Differences between the screening questionnaires content and wording are detailed in Appendix 5.

Phase 2: ÖMSQ validation

Psychometric characteristics

Baseline responses The baseline responses (Appendix 6) demonstrated normalised distribution for the original-ÖMPQ while the ÖMSQ was non-normal. Normality was determined through satisfactory histograms and Q–Q plots for both screening questionnaires. However, the Shapiro–Wilk test [7] was normal for the original-ÖMPQ $D(110) = 0.988$, $p = 0.445$ ($p > 0.05$), but statistically non-normal for the ÖMSQ $D(106) = 0.975$, $p = 0.044$ (by the amount of $p = 0.006$). Consequently non-parametric statistical analysis was required.

Reliability Test–retest reliability was high for the ÖMSQ (ICC = 0.976, range = 0.963–0.984) and original-ÖMPQ (ICC = 0.982, range = 0.972–0.988).

Criterion validity Correlation was established as very high between the screening questionnaires' baseline measures ($r = 0.97$, $p < 0.001$) and also between the individual items and total construct scores ($r = 0.96$ to 0.99 $p < 0.001$).

Predictive validity *Convergent validity* showed that the area under the curves (AUCs) for the screening questionnaires positive traits were comparable and ranged from 0.85 to 0.88 and 0.84 to 0.88, respectively, with the negative traits from 0.12 to 0.15 and 0.12 to 0.16, respectively. The optimal likelihood ratios (LRs) gave respective cut-off scores for each outcome at 6 months that ranged from 112 to 120 ÖMSQ-points and 113 to 120 original-ÖMPQ-points (Table 2).

Divergent validity showed that in the presence of each outcome trait the screening questionnaires' scores were significantly higher ($p < 0.001$) and the between-group difference indicated a medium-to-large effect size (Appendix 7). This was supported by the strong correlation between the screening scores and t^{80} (the time to achieve 80% recovery on the SFI) (Spearman's $r = 0.71$ $p < 0.001$).

Factor analysis The correlation matrix for both ÖMSQ and original-ÖMPQ questionnaires was determined suitable from identical Kaiser-Meyer-Oklin values (0.68) and Barlett's Test of Sphericity ($p < 0.001$). Both screening questionnaires generated 'six factors' prior to screening plot 'inflection' with Eigenvalues >1.0, item-variance >5%

Table 3 ÖMSQ factor analysis in a low back pain population

	Factor					
	1 Physical function	2 Psycho-logical	3 Problem/pain	4 Personal	5 Other	6 Fear-avoidance
Q20 ADL and social	0.867					
Q18 Walk or light recreational activity	0.761					
Q19 Home activity	0.723					
Q17 Light work—1 h	0.673					
Q21 Sleep or movement in bed	0.662					
Q14 Fear-avoidance: activity makes worse	0.439					
Q13 Job satisfaction	0.380					
Q8 Coping						
Q10 Depression		0.915				
Q9 Anxiety		0.648				
Q11 Recovery expectation: of problem		0.444	0.423			
Q6. Problem severity—chronic			0.972			
Q7 Problem frequency			0.623			
Q3 Problem duration				0.962		
Q2 Absenteeism				0.643		
Q12 Recovery expectation: of work						
Q5 Problem intensity—acute					0.968	
Q4 Burdensome		0.362			0.504	
Q16 Fear-avoidance: stop work/ADL if worse	0.355					0.887
Q15 Fear-avoidance: stop activity if worse						0.353
Q1 Region						
Internal consistency for 21 ÖMSQ-items $\alpha = 0.839$						
Internal consistency for each factor (α=)	0.812	0.745	0.703	0.760	0.641	0.495

Factor analysis used maximum likelihood extraction and varimax rotation; 21 items ($n = 106$); suppression at 0.35

[7] and total cumulative variance of 65.7 and 67.1%, respectively. The rotated 'six-factor' solution showed strong loadings (Table 3 and Appendix 8) but items #1 and #8 failed to load in both questionnaires and ÖMSQ-item #12. Cross-loading was found in both questionnaires items #11 and #16 and ÖMSQ-item #4.

Internal consistency Internal consistency was high and comparable for both the ÖMSQ ($\alpha = 0.84$) and original-ÖMPQ ($\alpha = 0.83$). Individual α-values for each questionnaire's factor ranged considerably; ÖMSQ six-factors ($\alpha = 0.495$–0.812) but original-ÖMPQ five-factors ($\alpha = 0.638$–0.862) as factor six had only question #11. Items that failed to load were not included, cross-loaded items were included under both factors (Table 3 and Appendix 8).

Practical characteristics

Readability was similar between the two questionnaires. The ÖMSQ Flesch-Kincaid grade level was 6.5 with 65.5% reading ease, the original-ÖMPQ was grade level 6.4 and 66.5%.

Missing responses (Appendix 6) were notably lower for the ÖMSQ with eight responses missed affecting five questions (#6, 7, 11, 12 and 16) in seven of 106 questionnaires (6.6%). The original-ÖMPQ had 24 missing responses affecting nine questions (#2, 4, 6, 7, 11–13, 16 and 18) in 13 of 110 questionnaires (11.8%).

Completion time was similar for the ÖMSQ (5.57 ± 3.03 min) and original-ÖMPQ (5.59 ± 3.00 min). Scoring times were identical (1.18 min ± 10 s).

Discussion

The ÖMSQ was found to be both valid and reliable. The modifications to the original-ÖMPQ improved performance through constructs being consistent with the WHO-ICF themes and having face and content validity that broadened potential application to a wider range of musculoskeletal conditions. It demonstrated superior practicality with two-thirds less missed responses and 44% fewer affected respondents and questions. These changes did not compromise the predictive validity as demonstrated by

near identical AUCs (95% CI), sensitivity, specificity and LRs for predicting patient outcomes. These improvements comply with the key recommendations for a modified-ÖMPQ [21, 30].

The difference in baseline distribution normality between the screening questionnaires (Appendix 6) may be accounted for by the variation in samples. The ÖMSQ included only main study participants and was statistically non-normal, however, histogram inspection and Q–Q plots showed strong similarity to the original-ÖMPQ. The original-ÖMPQ had normalised distribution but included both main and pilot study participants at a 2:1 ratio.

The predictive validity was higher for both screening questionnaires than the 0.62–0.83 range previously reported for the original-ÖMPQ [13, 28, 30]. This may be accounted for by the higher proportion of acute participants or the cultural and geographical difference in populations [4, 30, 31]. The optimal cut-off for absenteeism was determined at 116 ÖMSQ-points and 115 original-ÖMPQ-points, within the range of 105–119 points established in eight previous original-ÖMPQ studies [4, 9, 12, 17, 22, 25, 29, 39]. Similarly for long term absenteeism (LTA), 120 points for both screening questionnaires is comparable to the upper range found in previous research.

The missed responses in this study are notably lower than previously reported for the original-ÖMPQ (acute/subacute patients at 25%, chronic at 16% [12]). This is most likely from improved content and face validity that enabled individual responses to be made where a daily routine other than work was required [13, 28].

The reliability of both screening questionnaires was higher than previously reported, probably due to the use of the three recommended methodologies. Three previous studies that tested the original-ÖMPQ's reliability in LBP populations did not use these standards. Grotle et al. [12] employed 2 days, ICC (1.1) and chronic participants; both Linton and Hallden [29] and Linton and Boersma [28] used seven, then 14–28 days, Pearson's product moment and both chronic and subacute participants. Though acute/subacute patients were anticipated to change quicker and result in a less reliable retest, this was not found in our study.

The determination of a six-factor structure using maximum likelihood extraction (MLE) is the first occasion this preferred method [6] has been used. These results improved previous findings, made with the inappropriate 'principle component analysis (PCA)', by Westman et al. [39] with 17 of 21 items in 'six factors' and Grotle's [13] three factors, that were actually six when reanalysed with MLE (personal communication Grotle 24 June 2008). The ÖMSQ results more closely approximate the ALBPSQ proposed constructs [26, 29] than the original-ÖMPQ.

The study limitations included the use of consecutive not randomly selected patients [21], though this is consistent with previous research [4, 9, 12, 17, 22, 25, 29, 39]. The data are LBP workers compensation specific and cannot be generalized to other body regions, inpatient or community settings or beyond 6 months.

Conclusions

The modifications of the original-ÖMPQ performed in this study comply with previous recommendations [21]. This produced the ÖMSQ which can substitute with confidence for the original-ÖMPQ in an acute/subacute LBP working population. The ÖMSQ is a valid, reliable adaptation with very high criterion correlation and near identical readability, completion and scoring times. It has improved practicality, face and content validity, a preferred factor structure and constructs compliant with the WHO-ICF themes. Consequently, the predictive ability was maintained and application broadened to a wider musculoskeletal injured population. Future research should investigate validity in both working and general populations providing cut-off values for different conditions and body regions. This will facilitate accurate prediction of chronicity and individual recovery time.

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