Technical Report

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Abstract

Objective

Low back pain (LBP) places a large burden on society through health professional services and medication use, and interferences with work, normal and physical activities. Widely used and accepted questionnaires for measuring the impact of musculoskeletal pain (including LBP) exist, but do not cover all these aspects and may be too lengthy for some epidemiologic research and clinical practice settings. We evaluated the use of five single items of LBP impact on professional service, medication, and interferences with work, normal and physical activities; and compared these five items against established validated questionnaires of LBP disability and multi-dimensional screening of pain disability.

Methods

We performed cross-sectional analyses of two population-based cohorts (with young adults and middle-aged adults). In both cohorts, LBP (Nordic questionnaire) and LBP impact (using the proposed five single items) were assessed. Validated questionnaires for multi-dimensional screening of long-term musculoskeletal pain disability (Orebro Musculoskeletal Pain Questionnaire) for young adults and LBP disability (Oswestry Disability Index) for middle-aged adults were used.

Results

In both cohorts, participants who reported LBP with impact on the proposed items displayed higher scores on validated questionnaires compared to those reporting LBP without impact. Number of LBP impacts increased with increasing scores on validated questionnaires and showed high predictive value. The five proposed items of LBP impact are able to distinguish people with different clinically important scores (from established questionnaires), showing their construct validity.

Conclusion

The described items provide a relevant and feasible tool to establish LBP impact in epidemiological research and clinical practice.

Key terms: Low back pain; Disability; Young adults; Middle-aged adults; Raine Study

Introduction

Low back pain (LBP) is the global leading cause of years lived with disability (Global Burden of Disease Study Collaborators, 2015). Key aspects of the individual and societal burden of LBP are its impact on health care seeking behaviour and activities of daily life. Health care impacts include seeking health professional advice and treatment and the use of medications (Ferreira et al., 2010, Deyo et al., 2009). Activity impact includes modification of activities of daily life such as occupation, education, normal activity and physical activity (Brazier et al., 2007, Buer and Linton, 2002). This subsequently results in work productivity loss (Wynne-Jones et al., 2014, Costa-Black et al., 2010), education-related opportunity loss (Roth-Isigkeit et al., 2005) and inactivity-related health risks (Lin et al., 2011, Lee et al., 2012). Assessing the burden of LBP regarding utilisation of health professional services and medication use as well as modification of activities of daily life is therefore important for better understanding and management of LBP.

There are a number of widely used and accepted questionnaires for the assessment of the impact of musculoskeletal pain, e.g. measuring the level of functional LBP disability with the Oswestry Disability Index (ODI) (Fairbank et al., 1980) and multi-dimensional screening of long-term disability from musculoskeletal pain with the Örebro Musculoskeletal Pain Questionnaire (OMPQ) (Linton and Boersma, 2003). Despite the widespread acceptance of these questionnaires, they do not include all the key aspects of the impact of LBP listed above. Further, they may be too lengthy for feasible use in some epidemiologic research and clinical practice settings. Single items might be better able to quickly assess the impact of LBP due to less burden on the person being assessed and on the clinician, facilitating client-clinician discussion and joint clinical decision making.

We aimed to evaluate the use of five single items of LBP impact on health professional services and medication use, and activities of daily living; and to compare these items against established questionnaires using data from two population-based cohorts. Results from this study provide information on the construct validity of the five items of LBP impacts, demonstrating their value for use.

Methods

Study population

Data in this study are drawn from two population-based cohort studies; the Western Australian Pregnancy Cohort (Raine) Study and the Busselton Healthy Aging Study (BHAS). For both studies, ethics approval was obtained from the University of Western Australia and Curtin University human research ethics committees. Both studies were conducted in accordance with the Declaration of Helsinki and informed consent was obtained from all participants.

The Raine Study (www.rainestudy.org.au) began as a pregnancy cohort of women attending antenatal clinics in Perth, Australia. Children (and their families) were invited to participate in regular follow-up assessments. At age 22 (Straker et al., 2015), participants completed questionnaires on LBP, impact of LBP and risk of long-term musculoskeletal pain disability (n=1,249).

The BHAS (James et al., 2013) targeted all non-institutionalized adults born from 1946 to 1964 residing in the shire of Busselton, Australia. Between May 2010 and July 2011, participants completed questionnaires on LBP, impact of LBP and disability of LBP (n=1,004).

Measurements

In both cohorts, LBP was assessed using the Nordic Musculoskeletal pain questionnaire (Kuorinka et al., 1987) modified to consider pain in the last month. The impact of LBP in the last month was assessed across five single items (see Tables 1 & 2 for exact phrasing used). These items capture different aspects of LBP impact previously utilized in research (Kuorinka et al., 1987, Mitchell et al., 2008, O'Sullivan et al., 2012), including items on key aspects of LBP burden: impact on health professional service use (Ferreira et al., 2010), medication use (Deyo et al., 2009), and modification of activities of daily life in occupation (Wynne-Jones et al., 2014, Costa-Black et al., 2010), normal activities (Buer and Linton, 2002), and physical activities (Lin et al., 2011).

Data from established questionnaires were used for comparison to the five single item questions. In the Raine Study the OMPQ, a multi-dimensional screening tool for long-term musculoskeletal pain (not just LBP) disability (Linton and Boersma, 2003), was used. In BHAS, LBP disability was assessed using the ODI (Fairbank et al., 1980).

Data analysis

Participants who reported having LBP in the last month were analysed. Using independent t-tests, OMPQ scores (for young adults) and ODI scores (for middle-aged adults) were compared between those with and without experience of each LBP impact. Moreover, the associations between the sum-scores of the number of impacts per person with the established questionnaire scores were assessed using Spearman's correlation. Predictive value of the sum-scores of the number of impacts per person for OMPQ and ODI, respectively, was assessed by plotting receiver operating characteristic (ROC) curves and estimating their area under the curve. To do so OMPQ and ODI scores were dichotomized using established cut-off points of 20 (Hill et al., 2010) and 8.73 (Tonosu et al., 2012), respectively. P-values <0.05 were considered statistically significant, and all statistical procedures were performed using Stata (Release 13. StataCorp, College Station, TX).

Results

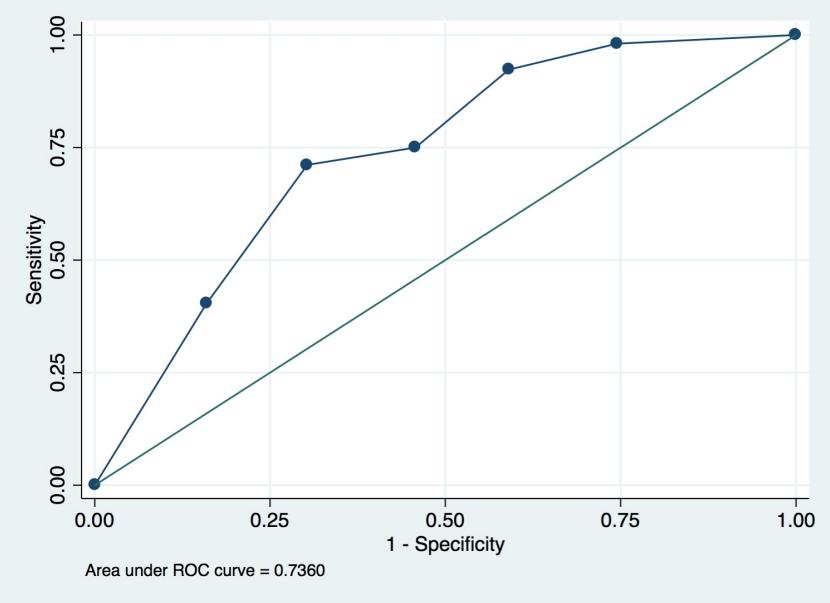
Among young adults with LBP (n=240/1,249 (19%); aged 22.0(0.6) years and 158(66%) females), average OMPQ scores of 71.9(22.4) were reported. Participants who reported LBP with each impact displayed significantly higher OMPQ scores compared to those without LBP impact (Table 1). OMPQ scores increased with an increasing number of LBP impacts (Spearman's rho=0.399, p<0.01) while the area under the ROC curve [with 95% CI] was 0.74 [0.67 0.80] (Figure 1).

Table 1: Impact of LBP according to the five proposed items and risk of long-term musculoskeletal pain disability scores using an established and validated questionnaire, for young adults (Raine study). Means (standard deviations) of the Orebro musculoskeletal pain questionnaire (OMPQ) score for subjects reporting low back pain (LBP) in the last month are shown, stratified by the experience of impact of LBP and by the number impacts sum score.

Individual Impacts	**OMPQ Score[1] No impact**	**Impact**	**Diff**	**95%CI**	**p**
Care Seeking Impacts					
Have you sought health professional advice or treatment for low back pain? (138/240)	65.8 (21.6)	76.5 (22.0)	10.7	5.1-16.3	<.001[2]
Have you taken medication to relieve the low back pain? (128/240)	64.8 (20.9)	78.2 (21.9)	13.4	7.9-18.8	<.001[2]
Activity Modification Impacts					
Have you missed work or study due to the low back pain? (69/240)	67.9 (20.0)	81.9 (25.0)	14.0	7.9-20.0	<.001[2]
Has the low back pain interfered with your normal activities? (147/240)	61.5 (16.5)	78.6 (23.3)	17.1	11.7-22.6	<.001[2]
Has the low back pain interfered with recreational physical activities? (138/240)	63.8 (18.3)	78.0 (23.3)	14.1	8.6-19.6	<.001[2]
Number of impacts sum score (n=240)		**OMPQ Score**			
0 impacts (n=49)		57.7 (15.6)			<.001[3]
1 impact (n=32)		65.9 (19.9)			
2 impacts (n=34)		76.6 (21.4)			
3 impacts (n=31)		64.5 (17.7)			
4 impacts (n=43)		79.9 (20.0)			
5 impacts (n=51)		84.2 (24.8)			

[1]OMPQ scores varying from 0 to 210, with ≤105 = low risk, 105-130 = moderate risk, ≥130 = high risk of musculoskeletal disability.
[2]Independent t-test
[3]Spearman's rho=0.399

Figure 1: Receiver operating characteristic (ROC) curve depicting the predictive value of the number of the sum-scores of the number of impacts per person for OMPQ . Sensitivity is shown on the vertical axis while 1-specificity is shown on the horizontal axis.



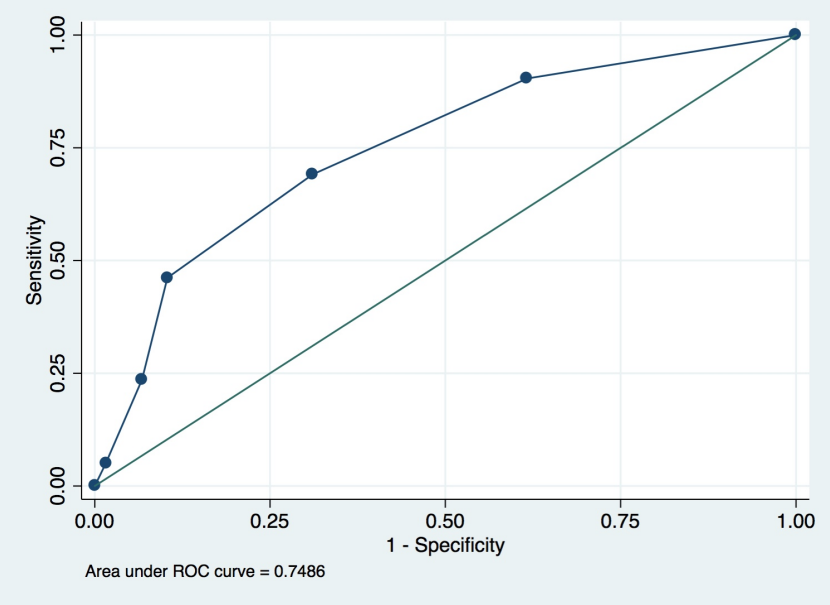
Among middle-aged adults with LBP (n=495/1,004 (50%); aged 56.0(5.4) years and 268(54%) females), average ODI scores of 13.9(10.4) were reported. Participants who reported LBP with each impact displayed significantly higher ODI scores compared to those without LBP impact (Table 2). ODI score increased with increasing number of LBP impacts (Spearman's rho=0.555, p<0.01) while the area under the ROC curve [with 95% CI] was 0.75 [0.71 0.79] (Figure 2).

Table 2: Impact of LBP according to the proposed five items and LBP disability using an established and validated questionnaire, for middle-aged adults (Busselton Healthy Aging Study). Means (standard deviations) of the Oswestry Disability Index (ODI) score for subjects reporting low back pain (LBP) in the last month are shown, stratified by the experience of impact of LBP and by the number impacts sum score.

Individual Impacts	**ODI Score[1] No impact**	**Impact**	**Diff**	**95%CI**	**P**
Care Seeking Impacts					
Have you sought health professional advice or treatment for low back pain? (274/495)	10.1 (8.4)	16.1 (11.3)	5.0	3.2-6.9	<.001[2]
Have you taken medication to relieve the low back pain? (201/495)	10.8 (8.5)	18.0 (11.3)	7.6	5.9-9.4	<.001[2]
Activity Modification Impacts					
Have you missed work due to the low back pain? (30/495)	13.2 (9.8)	24.9 (14.3)	11.8	8.1-15.5	<.001[2]
Has the low back pain interfered with your normal activities? (187/495)	9.8 (7.7)	20.5 (11.0)	10.7	9.1-12.4	<.001[2]
Has the low back pain interfered with recreational physical activities? (229/495)	9.4 (7.6)	19.1 (10.9)	9.7	8.1-11.3	<.001[2]
Number of impacts sum score (n=495)		**ODI Score**			
0 impacts (n=103)		6.9 (5.6)			<.001[3]
1 impact (n=124)		10.4 (7.6)			
2 impacts (n=109)		11.8 (7.4)			
3 impacts (n=75)		21.6 (10.0)			
4 impacts (n=66)		21.7 (10.6)			
5 impacts(n=18)		29.0 (13.0)			

[1]ODI scores range from 0 (no disability) to 100 (maximum disability).
[2]Independent t-test
[3]Spearman's rho=0.555

Figure 2: Receiver operating characteristic (ROC) curve depicting the predictive value of the number of the sum-scores of the number of impacts per person for ODI. Sensitivity is shown on the vertical axis while 1-specificity is shown on the horizontal axis.



Discussion

Our results show that for young and middle-aged adults the proposed impact items describing five key aspects of the burden of LBP were able to distinguish people with different clinically important scores based on validated and reliable measures for multi-dimensional screening for long-term musculoskeletal pain disability (OMPQ) and LBP disability (ODI). While OMPQ and ODI capture different aspects of the LBP experience, their association with the five impact items provides support that the items broadly capture important aspects of the LBP impact experience. These findings support the construct validity of the five single LBP impact items given that OMPQ and ODI are among the most commonly used disability and disability screening measures regarding musculoskeletal pain (Chapman et al., 2011, Linton and Boersma, 2003). Additionally, the items cover critical care seeking issues of health care seeking and medication use as well as activity modification issues of impacts on occupation, normal activities and exercise, contributing to the global burden of LBP (Global Burden of Disease Study Collaborators, 2015). Use of these five items may thus provide a better capture of the societal and individual impact of LBP than the OMPQ and ODI.

Compared to the two well-established but longer questionnaires used in comparison, the single items may be more acceptable for epidemiological studies and in some clinical practice settings because of the reduced participant and clinician burden, and facilitation of client communication.

In the current study, data from two community-based samples of the Australian population were analysed, providing a broad representation for both young and middle-aged Western adults. However, the representativeness of these findings for other (e.g., clinical or other ethnicity) populations remains unknown and should be assessed in future research. Future prospective studies could also investigate the mechanisms and trajectories for LBP impacts.

In conclusion, the five described items provide a relevant and feasible tool to establish the impact of LBP in young and middle-aged adults that can be used for future epidemiological studies and routine clinical practice.

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