

1 **Abstract**

2 **Background:** Low back pain is a common health problem encountered by various populations among countries.  
3 This prospective study aimed to translate and cross-culturally adapt the Japanese Orthopaedic Association Back  
4 Pain Evaluation Questionnaire (JOABPEQ) into Traditional Chinese and to assess its validity, reliability and  
5 sensitivity in Chinese patients experiencing low back pain.

6 **Methods:** Double forward and single back translation of the JOABPEQ was performed with cross-cultural  
7 adaptation. By convenience sampling, the final version of the translated JOABPEQ was administered to Chinese  
8 patients attending a specialty outpatient clinic with a history of back pain, followed by the traditional Chinese  
9 versions of Oswestry Disability Index (ODI) and Short Form-12 version 2 (SF-12v2). Construct validity of the  
10 domains were assessed using Spearman's correlation test. Internal consistency was assessed by Cronbach's alpha  
11 ( $\alpha$ ). Sensitivity of the adapted JOABPEQ was determined by known group comparisons.

12 **Results:** A total of 100 patients were recruited. The translated JOABPEQ demonstrated excellent overall internal  
13 consistency ( $\alpha$ : 0.912); and good internal consistency for the domains of Lumbar Function, Walking Ability, Social  
14 Life Function and Mental Health ( $\alpha$ : 0.811, 0.808, 0.788, and 0.827 respectively). Scores of all domains of the  
15 translated JOABPEQ had significant correlations ( $p < 0.01$ ) with ODI at all domains, as well as with almost all  
16 domains of SF-12v2 ( $p < 0.01-0.05$ ). The translated JOABPEQ was sensitive in detecting differences in patients  
17 with/without a history of previous spine surgery, and also between patients with acute/acute on chronic versus  
18 chronic pain in specific domains.

19 **Conclusions:** The Traditional Chinese version of JOABPEQ has satisfactory psychometric properties in general,  
20 including adequate clinical and construct validity, and internal consistency in assessing Southern-Chinese patients  
21 with low back pain. It is demonstrated as a sensitive outcome measure. The translated JOABPEQ is verified for its

1 use in the local clinical setting for patient assessment and future research.

## 1 **Introduction**

2       According to the World Health Organization (WHO), Low Back Pain (LBP) is the most disabling disease  
3 worldwide.[1] LBP is also the most common type of pain reported by adults in the United States,[2] and can affect  
4 one-third of the UK adult population each year.[3] Moreover, in Japan, the lifetime LBP prevalence was found to  
5 be 83%.[4] When LBP becomes chronic, it becomes one of the main reasons to seek health care services.[5, 6]  
6 LBP is complex with many etiologies and is often a mixture of various presentations and associated conditions  
7 including spinal stenosis, spondylolysis, disc degeneration and herniation, and spondylolisthesis. As a result,  
8 symptomatology not only manifests as back pain but also accompanying neurological symptoms such as lower  
9 limb numbness. Due to the variable nature of this disease, it is desirable to have a LBP-specific, single measure  
10 incorporating these multidimensional aspects, in order to facilitate communication between medical practitioners.

11       The Japan Orthopaedic Association (JOA) has introduced the JOA score rating system as a specific measure  
12 for LBP in 1986.[7] However, it has shortcomings due to lack of patient-orientated measures as the patient's  
13 perspective is an essential component in the evaluation of treatment outcomes and medical decision making.[8]  
14 The Japanese Orthopaedic Association Back Pain Evaluation Questionnaire (JOABPEQ) is then developed as a  
15 patient-perceived outcome measure for patients with LBP, which includes the original physical components  
16 related to the disease, and also psychological problems resulting from dysfunctions and disabilities.[9-11] It has  
17 been tested for its reliability and validity in the use for LBP patients in Japan, Thailand, Iraq and Turkey.[10, 12-14]

18       Due to the differences in culture and geographic location, it is desirable for the JOABPEQ to be translated to  
19 a Chinese version for local adaptation. This will ensure that this patient-orientated disease-specific instrument can  
20 elicit appropriate information about the severity of LBP along with quality of life (QoL). By ascertaining the  
21 psychometric properties of the translated JOABPEQ, healthcare professionals can utilize this standardized and

1 region-specific assessment tool to communicate progress of a patient's status through its natural course or after an  
2 intervention. As such, the aim of study is to translate the JOABPEQ questionnaire into Chinese whilst maintaining  
3 the characteristics of the original property of JOABPEQ to facilitate the assessment of the patient-perceived/  
4 reported function and QoL of LBP patients.

5

## 6 **Materials and Methods**

### 7 *Subjects and Setting*

8 A convenience sampling of Chinese patients attending a specialty back pain outpatient clinic during the  
9 months between April 2016 and November 2016 was performed. Exclusion criteria included patients of  
10 non-Chinese ethnicity, illiterate or could not understand traditional Chinese characters or speak Cantonese. Ethics  
11 approval was obtained from the institutional review board.

12 Demographic and clinical data at the time of visit were collected. Clinical data included  
13 clinician-documented episodes of LBP being acute (< 6 weeks duration), chronic ( $\geq 12$  weeks' duration) or acute  
14 on chronic (acute episode or deterioration of pain requiring hospitalization or an emergency visit), as well as only  
15 back pain or with radiating leg pain and numbness.[15] Also, radiographic diagnoses by attending orthopedic  
16 surgeons including spinal deformities (scoliosis, spondylolisthesis), disc degeneration, and lumbar spondylosis  
17 (degeneration with osteophytes) were extracted. Histories of any previous spine surgery, any previous trauma  
18 relating to spine or accidental fall were recorded. Clinicians who attended these subjects for consultation visit have  
19 no prior knowledge of this study.

20 Subjects who consented were invited to fill in the translated JOABPEQ (Traditional Chinese – Hong Kong).  
21 Upon completion, the patients were also asked to complete the Traditional Chinese (Hong Kong) version of the

1 Oswestry Disability Index (ODI) and the Short term 12-item Health Survey version 2 (SF-12v2) questionnaires.  
2 We aimed for 100 patients as according to Terwee *et al*[16], a sample size of 100 is considered adequate for  
3 psychometric factor analyses of health status questionnaires.

4

5 *Translation and Cross-culture Adaptation*

6 The original version of JOABPEQ was translated into traditional Chinese (Hong Kong) following one of the  
7 internationally accepted translation techniques,[17] which consisted of double forward translation and single back  
8 translation. The translations were performed by independent professional translators, who were native speakers of  
9 Cantonese and understand local terms in traditional Chinese used in Hong Kong. After the first forward translation,  
10 the translated traditional Chinese version of JOABPEQ was reviewed by a panel of local health-related  
11 professionals (consisting of at least one spine specialist). It was then back-translated into English by a professional  
12 translator who had no prior knowledge of the original questionnaire. The final forward translation was carried out  
13 by an independent translator. The final version of the translated and culturally-adapted JOABPEQ in traditional  
14 Chinese (Hong Kong) was finalized and approved by the review panel. (Appendix 1)

15

16 *Study Instruments*

17 Japanese Orthopaedic Association Back Pain Evaluation Questionnaire (JOABPEQ)

18 The JOABPEQ was developed specifically to evaluate LBP, and is based mainly on recognizing problems  
19 with activities of daily living.[18] It contains 25 questionnaires which are categorized into five factors. By using the  
20 measurement scale, each factor is then scored up to 100 points and to be evaluated separately. Also, at the end of  
21 the questionnaire, visual analogue scale (VAS) is used to ask patients to rate the degree of their low back pain, pain

1 in buttock(s) and lower limb(s), and numbness in buttock(s) and lower limb(s) during the recent past week. A bar  
2 is marked with 0 as 'no pain (numbness) at all' and 10 as 'the most intense pain (numbness) imaginable'. In  
3 addition, there was a five-point Likert scale introduced in this study immediately upon completion of the translated  
4 JOABPEQ. This was to facilitate patients to rate the clarity and understanding the translated JOABPEQ, from 1 to  
5 5, representing Strongly Agree, Agree, Neither agree/disagree, Disagree, Strongly Disagree.

6

### 7 Oswestry Disability Index Questionnaire (ODI)

8 The ODI is an index derived from the Oswestry Low Back Pain Disability Questionnaire,[19] which is a  
9 self-administered outcome measure designed to assess limitations of various activities of daily living.[20] It is  
10 considered the 'gold standard' of low back functional outcome tools, and is used to measure patient's permanent  
11 functional disability.[21] The questionnaire is divided into ten sections, of which each is scored on a 0–5 scale, with  
12 increasing level of disability. The index is calculated by dividing the summed score by the total possible score,  
13 which is then multiplied by 100 and expressed as a percentage. If the ODI ranges from 21% to 40%, it represents  
14 that the patient experiences more pain and difficulty with sitting, lifting and standing. Travel and social life are  
15 more difficult and they may be disabled from work. If the ODI is between 41% and 60%, pain remains the main  
16 problem and activities of daily living are affected. If the ODI reaches 61% to 80%, it represents the back pain  
17 impinges on all aspects of the patient's life. Validity of ODI for use in Hong Kong Chinese population has been  
18 reported.[22]

19

### 20 Short Form 12 – version 2 (SF-12v2)

21 The SF-12v2 Health Survey is a shorter version of the SF-36v2 Health Survey. It is a generic, health-related

1 QoL measure that assesses the functional health and well-being from the patient's perception. It consists of twelve  
2 questions, designated into eight domains from which the two composite scores of mental and physical health are  
3 derived. SF-12v2 was found to be a valid, sensitive and reliable substitute of the SF-36v2 for the Chinese in Hong  
4 Kong.[23]

5

### 6 *Statistical Analysis*

7 Descriptive statistics including mean  $\pm$  standard deviation (SD), and percentage of the study population were  
8 calculated. The construct validity of the JOABPEQ domain was assessed using Spearman's correlation test against  
9 the SF-12v2 domain scores holding similar constructs.

10 The internal consistency reliability was assessed by Cronbach's alpha using a value  $>0.7$  to indicate adequate  
11 internal consistency. The sensitivity of the JOABPEQ was determined by performing known group comparisons  
12 by independent t-test and analysis of variance, where appropriate. Comparisons of known clinical groups were  
13 among patients who had a history of previous spine surgery, a history of trauma relating to the spine or accidental  
14 fall, a diagnosis of spinal deformities (scoliosis, spondylolisthesis), disc degeneration, lumbar spondylosis/  
15 degeneration with osteophytes, as well as examining patients with acute or chronic or acute on chronic LBP, and  
16 location of pain (back only versus back and leg pain $\pm$ numbness).

17 Data analyses were conducted using SPSS Windows 23.0 (IBM SPSS Inc., Chicago, IL, USA) and STATA  
18 version 13.0 (StataCorp LP, College Station, Texas, U.S.). P-value $<0.05$  was statistically significant.

19

## 20 **Results**

21 A total of 100 patients were recruited, with 57% being females and 43% being males. The mean age of the

1 studied population was  $57.0 \pm 12.5$  years. The clinical characteristics of patients are presented in Table 1. The  
2 descriptive statistics of JOABPEQ and the VAS scores for low back pain, pain in buttock(s) and lower limb(s), and  
3 numbness in buttock(s) and lower limb(s), ODI and SF-12v2 subscale and summary score can be found in Table 2.  
4 There were 83% of patients who agreed or strongly agreed that the translated questionnaire was clear and  
5 understandable, with 17% had neither agree nor disagree, and none disagreed. This is presented together with the  
6 frequency distribution of responses of JOABPEQ in Table 3.

7 Psychometric testing of the translated JOABPEQ (Traditional Chinese – Hong Kong) demonstrated an  
8 excellent overall internal consistency with Cronbach's alpha of 0.912. (Table 4) Internal consistency was  
9 demonstrated to be good for the domains of Lumbar Function, Walking Ability, Social Life Function and Mental  
10 Health (Cronbach's  $\alpha$ : 0.811, 0.808, 0.788, 0.827 respectively) but inadequate for the Low Back Pain domain  
11 (Cronbach's  $\alpha$ : 0.531). There were significant correlations ( $p < 0.01-0.05$ ) between all domains of the translated  
12 JOABPEQ with all domains of SF-12v2, except for General Health and Vitality. In addition, the translated  
13 JOABPEQ also correlated significantly ( $p < 0.01$ ) with the ODI at all domains as well as its VAS scores for low  
14 back pain, pain in buttock(s) and lower limb(s), and numbness in buttock(s) and lower limb(s).

15 Testing of sensitivity of the translated instrument was performed and results are detailed in Table 5.  
16 JOABPEQ was sensitive in detecting differences in patients who had a history of previous spine surgery as  
17 compared to those without, in the domains of Low Back Pain and Walking Ability. The JOABPEQ was also  
18 sensitive to differences between patients with acute/acute on chronic versus chronic pain patients with its Low  
19 Back Pain domain.

20

## 21 **Discussion**



1 LBP is not only a major cause but one of the commonest causes of disability, and affects most people in a  
2 society at some point in their lives.[1] Presentations to the emergency department are not uncommon and consume  
3 significant healthcare resources.[24-26] An appropriate outcome assessment should not be merely a tool for  
4 communication between clinicians regarding the physical assessments, but needs to contain patient-perceived  
5 components which is a more meaningful interpretation of how LBP affects QoL. For instance, low back and leg  
6 pain are the chief complaints of herniated discs and spinal stenosis causing nerve compression. Management is not  
7 only targeting at elimination of pain and numbness, but also focus on the impairment and effects on QoL.[27] The  
8 extent of how QoL is being affected by LBP should be elicited by an appropriate outcome measure.

9 JOABPEQ is an outcome measure of choice as it is developed specifically for LBP, and it makes possible a  
10 comprehensive representation of patients' status by incorporating both the objective clinical assessment by  
11 clinician as well as subjective rating by patients. The translated JOABPEQ demonstrated an excellent overall and  
12 good internal consistency for the domains of Lumbar Function, Walking Ability, Social Life Function and Mental  
13 Health, except for the Low Back Pain domain. This can be largely accounted by the profile of the studied  
14 population, which consists of 14% of chronic LBP patients who were not experiencing any current pain but  
15 requiring regular outpatient clinic follow-ups. This is suggested by the lack of significant correlation of the VAS  
16 score of current LBP with the Low Back Pain domain. Additionally, 78% of the patients were chronic LBP patients,  
17 who might not necessarily be experiencing constant ache, lying down more than usual or cannot sleep well as  
18 questioned by the items contributing to the Low Back Pain domain. Definitely this factor will need further detailed  
19 investigation with larger sample size at multiple clinics.

20 As compared to the both Thai, Iran, and Turkish JOABPEQ studies[12-14], our translated JOABPEQ had  
21 satisfactory reliability and comparable internal consistency in all the domains Lumbar Function, Walking Ability,

1 Social Life Function and Mental Health (Cronbach's  $\alpha$ : 0.811, 0.808, 0.788, 0.827 respectively) except the Low  
2 Back Pain domain (Cronbach's  $\alpha$ : 0.531). The Traditional Chinese version of the JOABPEQ was found to  
3 correlate significantly ( $p < 0.01$ ) with the scores in VAS for low back pain, pain in buttock(s) and lower limb(s), and  
4 numbness in buttock(s) and lower limb(s). The Low Back Pain and Walking Ability domains supported the  
5 sensitivity of the JOABPEQ subscale scores to the difference among patients with/without a history of previous  
6 spine surgery. In addition, our translated JOABPEQ is also significantly correlated to ODI (at all domains) and  
7 SF12v2 (all domains except General Health Perception). Hence despite a different study approach, our findings are  
8 comparable, with additional findings unique to this local back pain population.

9 As JOABPEQ is partly derived from the Roland Morris Questionnaire and the medical outcome study  
10 36-Item Short-Form Health Survey (SF-36),<sup>[9]</sup> it is thus important to examine the ability of the adapted  
11 JOABPEQ version in correlating with a generic QoL measure. The translated JOABPEQ had all its domain  
12 significantly and strongly correlated with the ODI as well as the SF-12v2 in all aspects, except for correlation of  
13 General Health and Vitality with the Low Back Pain domain. It is suggested that adequate properties of QoL  
14 measure have been maintained in the translated JOABPEQ, which is capable of reflecting any relationship  
15 between LBP and the patients' limitations of daily activities, functional health and general well-being.

16 Moreover, the translated JOABPEQ is sensitive in detecting any differences in scores between patients with  
17 and without a history of spine surgery by the domain of Low Back Pain and Walking Ability. It is crucial that the  
18 JOABPEQ can differentiate these groups of patients especially at baseline assessment to claim that it is receptive to  
19 any changes after surgery. Apart from contributing to a valid comparison between preoperative and postoperative  
20 status, this sensitivity is also needed in capturing further improvement rate postoperatively. If the Low Back Pain  
21 and the Walking Ability domain scores of JOABPEQ are sensitive to differences between those who have or never

1 had any spine surgery, then these domains aid in assessing any further improvement during post-operative care or  
2 rehabilitation stage when the scores have already taken the occurrence of surgery into account. Also, the Low Back  
3 Pain domain is sensitive to changes of scores between acute and chronic LBP patients. It is essential to display such  
4 sensitivity when patients present with an acute onset of pain, or even more clinically useful when chronic patients  
5 present with acute episodes of pain, or deteriorated/increased of severity of pain during a rather stable condition.

6 The main limitation of this study is that this validation of JOABPEQ was carried out only in a single center. Further  
7 studies are needed with larger population size and preferably be conducted at multiple centers. Also, it is necessary  
8 to further investigate the responsiveness of the translated JOABPEQ for patients at several time points with certain  
9 intervention such as preoperatively versus postoperatively. In addition, JOABPEQ scores were reported to be  
10 different depending on age, sex and disease type based on individual patient data.[28] If reference values of  
11 JOABPEQ are not established, clinicians cannot assess the exact status of a patient at a single time point. Hence,  
12 future possibility of defining reference values for the local population, or for patients in China as a whole should be  
13 considered.

14 The Traditional Chinese version of JOABPEQ has satisfactory psychometric properties in general, including  
15 adequate clinical and construct validity, and internal consistency in assessing Chinese patients with LBP. It is also  
16 demonstrated as a sensitive outcome measure to be used in the local clinical setting. With its strong correlation with  
17 the generic measures, the translated JOABPEQ allows the reflection of not only the severity of LBP, but a valid  
18 representation of the impact of symptoms on patients' QoL, and their perceived improvement through time. This  
19 make feasible a closer examination of the cost-effectiveness of differential treatment options of LBP in the future,  
20 in the hope to maximize the use of healthcare resources.

21

- 1 **Conflict of interest:** No funding received for this work from any organizations
- 2 **Ethics Approval:** HKU/HA HKW Institutional Review Board

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