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Assessment of pain and disability in patients with chronic low back pain: Reliability and construct validity of the Turkish version of the Quebec Back Pain Disability Scale and Pain Disability Index

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Abstract. *Objectives*: The objective of this study was to test the reliability and validity of the Turkish version of the Quebec Back Pain Disability Scale (QBPDS) and Pain Disability Index (PDI) as well as the retainment of the psychometric properties of the original versions. The importance of the region-specific functional measures on patients with chronic low back pain was also assessed.
Methods: Eighty-three patients with chronic low back pain were enrolled in the study. The QBPDS, the PDI and The Hospital Anxiety and Depression Scale (HADS) were filled by all subjects. Reliability was determined by internal consistency. Internal consistency was measured by calculating Cronbach's alpha and item-total correlation. Validity was examined by correlating the QBPDS and PDI scores to external criteria scores at a single point in time, defined as cross-sectional construct validity.
Results: Cronbach's alpha value for QBPDS and PDI was found 0.93 and 0.84 respectively, which were both statistically significant ($p < 0.0001$). The item-total correlations of QBPDS varied between 0.28 and 0.76, and that of PDI varied between 0.30 and 0.73. The cross-sectional construct validity coefficients of QBPDS were 0.63 for PDI, 0.46 for Visual Analogue Scale (VAS), 0.28 and 0.16 for HADS. Correlation coefficients of PDI were 0.49, and those of VAS and HADS were 0.36 and 0.24 respectively.
Conclusion: Our results are in accordance with the previous findings of the English and French versions of the QBPDS and English version of the PDI, indicating that these functional scales are valid and reliable. However, due to the considerable overlap between generic and region-specific functional instruments, the use of both scales is not necessary. We conclude that the QBPDS and PDI both measure predominantly functional status in patients with chronic low back pain.

Keywords: Functional status, low back pain, lumbar spine, reliability, validity

1. Introduction

Chronic low back is one of the most commonly encountered health problems in clinical practice and it has major social, occupational and psychological factors that are of importance in the development and per-

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sistence of symptoms [24]. The impact of low back pain is closely related to the limitation of a patient's everyday activities, and the assessment of the disability in patients with chronic low back pain is challenging. The disability term has been defined in the International Classification Impairment Disability Handicap (ICIDH) by the World Heath Organization (WHO) as "any restriction of lack of ability to perform an activity in a manner or within the range considered normal for a human being" [9]. There is a growing recognition that the need to consider patients' assessment of their own fuctional status or disability plays a significant role in the evaluation of current and future therapies. Over the last few years, several self-assessment and region-specific scales designed to evaluate functional status in low back pain have been developed [4,14,22]. Generic questistionnaires, such as the Pain Disability Index [3] and Sickness Impact Profile [2] measuring generalized pain and related disability or functional status are in use, but they are not specifically developed for the patients with low back pain. Despite the ubiquitous nature of lumbar spine disorders, there is no consensus on which instrument is best for measuring functional status or disability and changes in functional status in patients with low back pain. Generic questionnaires have the advantage of being more physchometrically sound and the ability of measuring the functional or health status with multi-dimensions. On the other hand, region specific questionnaires have the advantage on domains related to what is being measured [16].

Creating a new scale instead of translating and adapting a preexisting one is a time-consuming process and may lead to multiplication of outcome measures and lack of normalization. The Quebec Back Pain Disability Scale (QBPDS) has been developed by Kopec et al. [10]. The concepts used in the QBPDS are consistent with classical WHO definition of disability. It has been translated into various languages other than original English version and found to be a reliable and valid instrument assessing the functional status in patients with low back pain [23,29]. The Pain Disability Index (PDI) is also one of many measurement instruments that have been used to evaluate disability related to chronic pain [3,17]. Reliability and validity of the PDI has been proved in various studies [6,28]. However, to the best of our knowledge, QBPDS and PDI have never been used in Turkish population. In this study, the reliability and the construct validity of Turkish version of the QBPDS and PDI in Turkish patients with chronic low back pain was investigated. The role of region as compared to generic ones in measuring the disability in lumbar spine disorders was assessed. Correlation of disability with anxiety and depression to demonstrate whether the QBPDS and PDI evaluated the overall impact of low back pain was also investigated.

2. Material and methods

The study group consisted of 83 patients (20 men, 63 women) with chronic low back pain lasting for at least 6 months who directly applied or were referred by another physician to the outpatient clinics of Physical Medicine and Rehabilitation Department of a University hospital between January 2000 and December 2002. All patients were informed about the procedure. The study was performed in accordance with the principles of the Declaration of Helsinki and was approved by ethics committee of the hospital. None of the patients were immigrants, and patients who had not mastered the Turkish language sufficiently to complete the questionnaires by themselves were not included in the study. Patients who had other major diseases causing disability (i.e., inflammatory diseases, myopathy) regional tumor or metastasis, vertebral fractures, a disc herniation requiring surgical treatment, a psychiatric disorder, an underlying disorder causing low back pain, traumatic injuries, low back surgery within the previous three months, and pregnancy were excluded from the study.

2.1. Study design

Following the interview, all patients filled a brief form that described their demographic and clinical characteristics including age, gender, pain duration, body mass index (BMI), socioeconomic status, education level, occupation, smoking habits, presence of sedentary life style, previous neck surgery, and alcohol use. Careful physical examination assessing posture; low back and lower extremity range of motions; tightness of the paraspinous muscles and neurological function was accomplished by the same clinician (AB). Some maneuvers specific to determine the lumbar disorders were also carried out. Ensuing physical examination, subjects were asked to complete the questionnaires evaluating pain, disability and psychological status at the hospital under the supervision of the two investigators (AB, KY). Strict instructions were given to the patients that the questionnaires were to be performed without help after reading the instructions. Questionnaires were administered to the patients on

only one occasion since the study was designed to determine the current functional status and provide data on three different aspects of the current chronic-pain experience: pain assessment, disability related to pain, and psychological distress. Routine biochemical tests including glucose, transaminases, urea, creatinine, erythrocyte sedimentation rate, C-reactive protein, urinalysis, and plain X-rays and computerized tomography or magnetic resonance imaging of the lumbar column was performed in all subjects. After the final assessment, patients were either prescribed or referred to physiotherapy unit of the hospital for rehabilitation program. General and more specific ergonomic advice was offered to all patients.

2.2. Measures

Pain was evaluated by Visual Analogue Scale (VAS) which is a common instrument used worldwide with tested validity and reliability [8,12]. Patients were asked to rate their present pain intensity on a 10 cm straight line. The VAS scale was anchored at "no pain" (0 cm) and "most intense pain imaginable" (10 cm).

The QBPDS is developed in French and English, as a specific instrument for assessing functional disability in patients with low back pain. In consistence with ICIDH, functional disability is defined as difficulty with simple physical activities. The items are classified into six areas: rest/bed, sit/stand, walk, range of motion, bending and lifting/carrying, with a total of 20 items related to everyday activities. Each activity is scored on a six-point scale with higher scores indicating more severe disability ($0 =$ not difficulty at all; $5 =$ unable to do). The maximum total score is 100. The original version of the QBPDS was translated into Turkish by a professional bilingual translator team including one translator whose native language was English and three investigators were involved in this process. The translation was not word-for-word translation as recommended [7].

The PDI is a short, self report instrument which measures the degree to which pain presently interferes with living in the following seven areas: family/home responsibilities, recreation, social activity, occupation, sexual behavior, self-care and life-support activities [3, 25,26]. To fill the PDI, the respondent uses an 11-point scale ranging from 0 (no disability) to 10 (total disability). A total score is obtained by summing the responses to the seven items. Total score ranges 0 to 70. The PDI was also translated into Turkish by the same team, using the same procedure as described above.

The Hospital Anxiety and Depression Scale (HADS) is developed and found to be a valid and reliable instrument in detecting states of depression and anxiety. This also used in measuring severity of emotional disorders [30]. The HADS is validated and found reliable in Turkish population and this version is used in the present study [1]. It consists of 14 items measuring the severity of emotional stress in two separate subscales, 7 items measure the level of anxiety, and the rest the depression. Each item has 4 response categories, reflecting a continuum of increasing level of emotional distress. The scale ranges from no symptoms (0) to maximum of distress in total ranging to 21. Higher scores indicate more severe symptoms. We used 10 and 7 as the cutoffs for the anxiety and depression subscores, respectively.

2.3. Statistical analysis

All statistical analyses were performed using SPSS version 9.0 for Windows computer software package (SPSS for Windows, Chicago, IL, USA). A level of $p < 0.05$ was considered statistically significant.

Acceptability of the QBPDS and PDI was assessed by analyzing the subject's comments. Reliability is evaluated by measuring internal consistency. Internal consistency was measured by calculating Cronbach's alpha (value exceeding 0.7 was considered indicative of acceptable internal consistency) and the item-total correlation. Item-total correlation of QBPDS was calculated by Pearson's correlation coefficient. Correlations of 0.20 or more were considered to indicate good internal consistency. Internal consistency and item-total correlation of PDI was also measured by the same procedure, mentioned above.

Construct validity was used to assess the validity of the QBPDS and PDI. In this study, in order to obtain coefficients for cross-sectional construct validity, the QBPDS score was correlated with VAS, PDI and HADS scores. The PDI score was also correlated with VAS, QBPDS and HADS scores.

Descriptive statistics are reported as the means $\pm$ standard deviation (SD) for continuous variables (age, gender, body mass index, duration of pain). Pearson correlation coefficients were calculated between the continuous variables, PDI, HADS, and QBPDS scores. Spearman's rank correlation coefficient (nonparametric test) was used to evaluate the relationship between PDI and VAS. Relationship between categorical variables and PDI sum score were assessed by independent t test and ANOVA. When a significant relationship was found, odds ratio was calculated for the risk assessments.

Table 1
Demographic and clinical characteristics of the patients ($n = 83$)

Characteristics	Mean	SD	Minimum	Maximum
Age (years)	43.590	10.146	18	69
BMI (kg/m^2)	25.944	3.890	18.37	41.62
Duration of pain (years)	7.114	5.992	0.50	25
QBPDS Score (range, 0–100)	37.132	17.513	1	94
PDI Score (range, 0–70)	20.339	12.979	0	55
HAD- Depression (range, 0–21)	7.600	4.155	1	18
HAD- Anxiety (range, 0–21)	9.080	4.374	2	19
VAS Score (range, 0–10)	6.043	1.746	1	10

Values are the mean, standard deviation (SD), range (minimum-maximum), BMI: body mass index, QBPDS: Quebec back pain disability scale, PDI: pain disability index, HAD: hospital anxiety and depression scale, VAS: visual analogue scale.

Table 2
Summary of categorical variables ($n = 83$)

Variables	Category	Number*	Percent
Gender	Male	20	24.1
	Female	63	75.9
Education	Elementary	31	37.8
	High school	36	43.9
	University	15	18.3
Diagnosis by physician	Lumbar strain/myofacial	35	42.2
	Herniated/degenerated disk	25	30.1
	Osteoarthritis	15	18.1
	Spondylolystesis/spondylolysis	3	2.1
	Lumbalisation/sacralisation	4	2.8
	Sacroiliac degeneration	1	0.7
Occupation	Working in office	15	18.3
	Housewife	38	46.3
	Retired	18	22.0
	Other	11	13.4
Socioeconomic status	Low	18	22.0
	Middle	59	72.0
	High	5	6.1
Smoking habit	Smoker	39	47.0
	Non-smoker	41	49.4
	Ex-smoker	3	3.6
Alcohol use	User	11	13.3
	Non user	72	86.7
Previous neck surgery	Yes	1	1.2
	No	82	98.8
Sedentary life style	Yes	49	59.0
	No	34	41.0

*The total number of subjects is less than 83 due to missing values.

3. Results

The main demographic and clinical characteristics and categorical variables of the patients and are presented in Tables 1 and 2, respectively.

Acceptability of the QBPDS and PDI was satisfactory, with a completion time of less than 10 minutes. Even though item 4 (working activities) in PDI was the least responded item (33%), none of the items was excluded. There were few major problems about filling the QBPDS. The terms used in the original QBPDS were not the same (miles, instead of kilometers and lbs, instead of kilograms, for instance). Patients were not able to fill the items relevant to 9 and 20 in miles and lbs. Therefore, patientsf were asked to fill these items in kilometers and kilograms, corresponding to the same amount in the original questionnaire. Additionally, patients were also asked to fill the item number 8 (“walking a few blocks”) as “walking a few streets”, since the concept has no meaning in Turkey. Subjects did not know how to answer the items relevant to recreational and social activities in PDI, as the concept has somewhat different meanings in Turkey than in western countries. The investigators were contacted and

Table 3
Item-Total Correlation (ITC)[a]: Correlations between each item on the Quebec Back Pain Disability Scale (QBPDS) and the sum score of the QBPDS

Item no	ITC	P value
1. Get out of bed	0.547	< 0.001
2. Sleep disturbance	0.464	< 0.001
3. Turn over in bed	0.616	< 0.001
4. Travel in a car	0.612	< 0.001
5. Stand up for 30 minutes	0.540	< 0.001
6. Sitting	0.636	< 0.001
7. Climb one flight of stairs	0.517	< 0.001
8. Walk a few street	0.529	< 0.001
9. Walk several kilometers	0.557	< 0.001
10. Reach up to high shelves	0.679	< 0.001
11. Throw a ball	0.564	< 0.001
12. Run two street	0.619	< 0.001
13. Take food out of the fridge	0.605	< 0.001
14. Make your bed	0.673	< 0.001
15. Put on socks	0.637	< 0.001
16. Bend over a sink for 10 minutes	0.768	< 0.001
17. Move a table	0.623	< 0.001
18. pull or push heavy doors	0.287	< 0.002
19. Carrying two bags of groceries	0.557	< 0.001
20. Lift 20 kg	0.559	< 0.001

[a]Derived by Pearson's correlation coefficients.

examples with details were given to help the subjects to make their choices, when ambiguities are encountered.

Cronbach's alpha values for QBPDS and PDI were found 0.93 and 0.84, respectively which were statistically significant ($p < 0.0001$). The high value of Cronbach's alpha indicates the high internal consistency of the scales. The item-total correlations of QBPDS varied between 0.28 and 0.76 (Table 3). The item-total correlations of PDI varied between 0.30 and 0.73 (Table 4). All the items in QBPDS and PDI were statistically significant ($p < 0.0001$). Table 5 shows the coefficients for the cross-sectional correlation of QBPDS. The correlation coefficients between the QBPDS and PDI sum scores, and the QBPDS and the VAS score were 0.63 and 0.46, respectively. Strong correlation was found between the QBPDS and VAS score, and between QBPDS and PDI sum score ($p < 0.001$). The correlation between the QBPDS and HAD-depression sum score was 0.16 and this was not statistically significant ($p > 0.05$). The correlation between the QBPDS and HAD-anxiety sum score was 0.28 with a statistical significance ($p < 0.05$).

The correlation coefficient between the PDI and VAS score was 0.49 (Table 6). Strong correlation was also found between the PDI and VAS score ($p < 0.001$). The correlation between the PDI and HAD-depression sum score was not statistically significant ($p < 0.05$). However, correlation between the PDI and HADS-Anxiety was statistically significant ($p = 0.01$). There was no

Table 4
Item-Total Correlation (ITC)[a]: Correlations between each item on the Pain Disability Index (PDI) and the sum score of the PDI

Items	ITC	P value
Family/home responsibilities	0.687	$p < 0.001$
Recreation	0.732	$p < 0.001$
Social activity	0.689	$p < 0.001$
Occupation	0.302	$p < 0.001$
Sexual behavior	0.598	$p < 0.001$
Self care	0.715	$p < 0.001$
Life-support activity	0.665	$p < 0.001$

[a]Derived by Pearson's correlation coefficients.

Table 5
Cross-sectional construct validity of the Quebec Back Pain Disability Scale (QBPDS)[a]: Pearson's correlations coefficients between the sum scores of the QBPDS, Visual Analogue Scale (VAS)[b], and the Hospital Anxiety and Depression Scale (HADS)

Scales	Correlation coefficients	P value*
QBPDS and PDI	0.630	< 0.001
QBPDS and VAS	0.468	< 0.001
QBPDS and HADS-Depression	0.167	$p = 0.247$
QBPDS and HADS-Anxiety	0.283	$p = 0.047$

[a]Derived by Pearson's correlation coefficients.
[b]Derived by Spearman's rank correlation coefficient.
*Correlations are significant at the 0.01 and 0.05 levels (2-tailed).

correlation between the BMI and the QBPDS ($r = 0.059$, $p = 0.599$) and PDI ($r = -0.068$, $p = 0.546$) sum scores, and between the age and QBPDS ($r = 0.126$, $p = 0.257$) and PDI ($r = -0.156$, $p = 0.164$) sum scores. Duration of pain also revealed no correlation with the QBPDS ($r = -0.011$, $p = 0.922$) and PDI ($r = 0.132$, $p = 0.241$) sum scores. There was a statistical difference in gender, indicating that male patients showed 2.5 times higher risk than those female patients. Patients with low or middle socioeconomic status had 4.2 times higher risk than those patients with a high socioeconomic status (OR $= 4.2$, $p = 0.014$). Patients having no sedentary life style had 2.6 times higher than those patients having sedentary life style (OR $= 2.6$, $p = 0.014$). There was no significant correlation between the study group and any other categorical variables including occupation, education, smoking habit, previous surgery, alcohol use, and diagnosis type.

4. Discussion

In our study, in which the reliability and validity of the Turkish version of the QBPDS were assessed, our results showed that the reliability of the scale, as indicated by internal consistency and item-total correlation

Table 6
Cross-sectional construct validity of the Pain Disability Index (PDI)[a]: Pearson's correlations coefficients between the sum scores of the PDI, Visual Analogue Scale (VAS)[b], Quebec Back Pain Disability Scale (QBPDS) and the Hospital Anxiety and Depression Scale (HADS)

Scales	Correlation coefficients	P value*
PDI and QBPDS	0.630	< 0.001
PDI and VAS	0.495	< 0.001
PDI and HADS-Depression	0.249	$p = 0.082$
PDI and HADS-Anxiety	0.363	$p = 0.010$

[a]Derived by Pearson's correlation coefficients.
[b]Derived by Spearman's rank correlation coefficient.
*Correlations are significant at the 0.01 and 0.05 levels (2-tailed).

proved to be high as did the cross-sectional construct validity. In the search for the reliability of the Turkish version of the PDI, results were similar to those in QBPDS (Table 4). However, the absence of a control group and test-retest study design may limit the reliability of the clinical measurements. Another limitation of the study was, the inability to evaluate the repeatability of the scales and score-changes by comparing same or different instrument scores at two time points because of the cross-sectional design of the study. Therefore, longitudinal construct validity assessments by evaluative indexes should be taken into consideration to measure the magnitude of longitudinal differences between an individual and study over time.

The majority of the subjects had difficulty filling the item number 4 in PDI. Responsiveness of the item number 4 (pain interference with working) was only 33.7%. The possible explanation of this finding could that, the vast majority of the study group was consisted of either housewives or retired patients with a low or moderate socioeconomic status. Therefore, those patients in PDI could not answer the question, relevant to item number 4 ("Does your pain interfere with work activities?"). However, this item was not eliminated, since it was also clinically related to disability assessment of low back pain.

The age distribution of our study population was similar to those in other studies that used the QBPDS [20, 29]. However, sex ratio of our study group was inconsistent with the previous studies [20,29]. The QBPDS and PDI sum scores were similar to those in other studies that used QBPDS and PDI [5,20]. The HAD scores of anxiety and depression were consistent with previous reports [29]. The ratio of higher education (university graduation) was 18.3% in our sample. Further, 94% of the subjects in our study were in low or moderate socioeconomic level and 68% of the patients was housewife or retired. Consistent with other reports [18,19], the results of our study showed that chronic low back pain was more likely among subjects in lower or moderate social classes than among subjects in higher classes (OR $= 4.2$). Additionally, we found that chronic low back pain was more prevalent in subjects having non-sedentary life style than subjects having sedentary life style (OR $= 2.6$). Relationship between sport activities and low back pain is unclear. Mortimer et al reported that few hours with high-intensity training increased the relative risk of low back pain among women, but not in men. It was also stated that further investigations would be essential to gain a better knowledge regarding the sport activity, affecting the occurrence of low back pain [15]. Smoking and BMI are the risk factors for low back pain that have given rise to much controversy [11,15]. Neither BMI nor smoking revealed a significant relationship between low back pain disorders. No significant relation was found between any other categorical variables and the QBPDS and, PDI sum scores. Nevertheless, some caution is warranted when interpreting these results, since the number of cases in the analysis ($n = 83$) is somewhat lower than recommended, present sample may not be completely representative of the general population.

Disability caused by chronic low back pain is not well understood and there is no consensus on which instrument is the best for low back pain and related disability [13]. Specific questionnaires to assess regional disability are in use [3,4,22]. Some instruments including generic questionnaires have been used previously. Rieddle stated that either specific or general scales could be used to assess the cervical spine disorders and related disability and there was no benefit from using them together [21]. Consistent with this finding, we also found a high correlation between the PDI and QBPDS indicating that there appeared to be considerable overlap between the two instruments. A possible explanation is that PDI reflects to some extent physical health status, and it is also an instrument that has been developed to assess the disabling consequences of chronic illness, especially chronic pain.

Psychological variables are important in the onset and development of low back pain problems and depression, anxiety, distress and related emotions are closely related to long-term pain and disability [12]. In the original publication, QBPDS contains only several elementary physical activities. It does not have general questionnaires about personal care, sexual activities, work or social life, indicating that the psychometric properties of the scale are somewhat limited [10]. Our findings were consistent with these results. We found

fair correlation between HAD-anxiety score and the QBPDS sum score. Additionally, no statistically significant correlation was found between HAD-depression and the QBPDS sum score. Consistent with previous reports, these indicators confirm that the QBPDS evaluates functional disability rather than the overall impact of low back pain.

The PDI also has been shown to correlate particularly with depression, anxiety and other indicators of psychological distress in various studies that PDI proved to have acceptable psychometric properties [6, 26,27]. Our findings were inconsistent with these results. PDI correlated significantly only with the HAD-Anxiety score indicating that the psychometric properties of the PDI might not give good information about the patient's psychological status. However, the results regarding anxiety and depression should be compared to the prevalence of these disorders in the population at large, as the prevalence of these disorders may be in a large spectrum in different populations. Additionally, it is not possible to know whether the psychological disorder (mainly depression and anxiety) affect QBPDS and PDI scores or whether the patient's disability causes the psychological disorder, especially in cross-sectional studies. Prospective longitudinal studies are needed to answer questions regarding the cause.

In conclusion, despite its limitations, the findings concerning Turkish version of the QBPDS and PDI in the present study support results from earlier studies where the QBPDS and PDI have been established as reliable and valid instruments of functional ability in chronic low back pain patients. Our results also support the use of either the QBPDS summary scale or the PDI to assess the functional status of patients with chronic low back pain, indicating that the use of both measurements is not needed. However, special caution has to be taken into consideration that QBPDS or PDI may not reflect the overall impact of the chronic low back pain.

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