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Validation of the Japanese version of the Roland-Morris Disability Questionnaire

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Abstract The study was designed to validate a translated, culturally adapted questionnaire. We examined the reliability, validity, and responsiveness of the Japanese version of the Roland-Morris Questionnaire (RDQ) when assessing disability in Japanese patients with low back pain. The RDQ is a reliable, validated scale used to measure disability caused by low back pain. However, no validated Japanese version of this questionnaire is available. A series of 214 outpatients with low back pain participated in this validation study. The patients were given the RDQ and the SF-36, and assessed their pain and global rating of health. Among them, 57 who were clinically stable were given the RDQ again 2 weeks later. The reliability was examined based on the test-retest method and internal consistency. Sufficient reliability was demonstrated with a Chronbach's α coefficient of 0.85, and the reproducibility for the 30 patients was $r = 0.91$. The principal component analysis showed unidimensionality. The RDQ score of the 133 patients was significantly improved after treatment. The Japanese version of the RDQ is a useful scale that is easy to use with reliability, validity, and responsiveness when assessing patients with low back pain.

Key words Low back pain · Disability · Outcomes · Roland-Morris Disability Questionnaire · Japanese version

Introduction

Low back pain can limit the activities of the sufferer, have an adverse impact on their quality of life (QOL), and have a negative effect on work productivity. It is one of the most common ailments in developed countries, and it has been found to be the most common cause of extended absences from the work place.[3,4] The results of population-based epidemiological research on low back pain in the West are available in the literature,[2,13,17] and numerous studies have been conducted to determine psychosocial factors related to the onset of low back pain.[1,7,8,10,12,14]

Low back pain is also the most frequent complaint among Japanese, and it is second only to hypertension as the most common reason for patients to seek medical attention.[11] However, almost no research has been done in Japan to evaluate the outcome for low back pain using a patient-based outcome measure or to evaluate the social impact of low back pain. Furthermore, no adequate self-administered scale exists in Japan despite the availability of independently developed questionnaires and translated version of questionnaires developed in other languages. In light of this situation, we decided to create a Japanese version of the Roland-Morris Disability Questionnaire[15] (RDQ) which is used widely throughout the world.

The RDQ, created in 1983 by the British researchers Martin Roland and Richard Morris, is a scale that allows the patients themselves to assess the degree of disability experienced during daily activities as a result of low back pain. There are 24 items that ask about the degree of disability experienced during daily activities such as standing, walking, sitting, getting dressed, and working. This questionnaire has been translated into dozens of languages other than English,[16] and it is used to assess the treatment of low back pain and patient monitoring in a large number of countries.

We have successfully completed cross-cultural adaptation, and a pilot study demonstrated the feasibility, acceptability, and understandability of the Japanese version of the RDQ.[8] The objective of our research was to test the reliability, validity, and responsiveness of the Japanese version of the RDQ and to make the RDQ available for use in Japan.

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Materials and methods

Patients and setting

A series of 214 patients with low back pain who were seen on an outpatient basis in nine orthopedic surgery departments in Japan during the 2-month period that this research was conducted participated in the study. Patients with low back pain thought to be caused by malignant tumors, infectious diseases, and visceral diseases were excluded. The patients filled out a self-administered questionnaire on low back pain and functional states, and the data collected were used as the baseline values. The 57 patients who were classified by physicians as suffering from chronic low back pain without much change in symptoms were readministered the questionnaire 2 weeks later during an outpatient visit. The 133 new patients of the 214 patients in study were put on drug therapy and then answered the same questionnaire used in the baseline questionnaire 4 weeks after administration of the original baseline questionnaire. The physician-in-charge recorded the degree of spinal flexion, degree of pain, and degree of global symptoms on a Physician Record Sheet at each point of the RMD measurement. The protocol of this study was reviewed and approved by the institutional review board prior to the study.

Methods

After informed consent was obtained from the patients to participate in the study, they answered the questionnaire. The questionnaire included the RDQ, which measures functional status based on low back pain, the SF-36 survey for measuring global health-related QOL,[5,6,18] the Visual Analog Scale (VAS) for pain, and a VAS for global rating of health. After the questionnaires were completed the patients placed the questionnaires in a sealed envelope, which were then collected by the researcher-in-charge, who was someone other than the physician-in-charge.

Assessment of reliability, validity, and responsiveness

Reliability was investigated by looking at the reproducibility and internal consistency based on the test-retest method. The following analysis was conducted to examine the validity. A principal component analysis was conducted to examine the construct validity and the one-dimensionality of the scale. Correlation coefficients with the SF-36 were obtained, and the following hypotheses were examined to investigate concurrent validity: (1) the RDQ score and the SF-36 "physical functioning" would exhibit the strongest association; (2) "bodily pain" would exhibit the next strongest association; and (3) "mental health" and "vitality" would exhibit the weakest association. Examination of the criterion based validity looked at the following hypotheses: (1) the RDQ score would exhibit little association with gender or age; (2) the correlation between the RDQ score and the pain assessment VAS would be high; and (3) the correlation between the RDQ score and the global rating of health by the patient and physician would be high. Responsiveness was examined by comparing the scores obtained before and after drug treatment of osteoarthritis using a *t*-test.

Results

Patient characteristics

A total of 214 patients (115 men, 98 women, 1 undetermined) participated in the study. The mean age was 53.4 years (range 21–86 years). The mean RDQ score was 9.1 with a standard deviation of 5.0 and a range of scores from 0 to 22 (Table 1). The distribution of the RDQ scores was extremely close to a normal distribution (Fig. 1).

Reliability

Chronbach's α coefficient for the 24 items in the RDQ was 0.85. When the α coefficient was calculated for each of the 24 items by eliminating each item, one by one, the range was 0.840–0.857; and no items were found to change the internal consistency substantially.

There were 57 test-retest patients, and the period between the first and second tests was a mean of 13.8 days (range 7–21 days). The intraclass correlation

Table 1. Respondents' characteristics

Parameter	Males	Females	Unknown	Total
Age (years)				
20s	16	9		25
30s	21	9		30
40s	19	10		29
50s	19	21		40
60s	20	23		43
70s	17	21		38
80s	3	5		8
Unknown			1	1
Disease				
Spondylosis	11	22		33
Degenerative Spondylolisthesis	2	2		4
Spondylolysis	1			1
Spondylolytic Spondylolisthesis	1			1
Other	96	74	1	171
Unknown	4			4

coefficient (ICC) of the RDQ score for the first and second tests was 0.72, which indicates sufficient reproducibility.

The κ coefficient was calculated to confirm conformity for each item. This coefficient was broken down in the following manner: 0 to <0.2 was considered poor; 0.2 to <0.4 was fair; 0.4 to <0.6 was moderate; 0.6 to <0.8 was substantial, and ≥0.8 was almost perfect. We found that 1 of the 24 items was poor, and 5 were fair. Because the RDQ is a scale that asks about the patient's condition only in the "present," it was thought that the approximately 2-week period until the retest may be considered long if the objective is to confirm the reproducibility of the scale. Thus, 30 patients were selected who had only minimal changes in their own evaluation of pain over the 2-week period. When the κ coefficient was calculated for each item, one item was found to be "fair" (question 2), and all of the other items were rated as having a conformity of moderate or above. In addition, the ICC for the RDQ score was 0.92 for these 30 patients (Fig. 2).

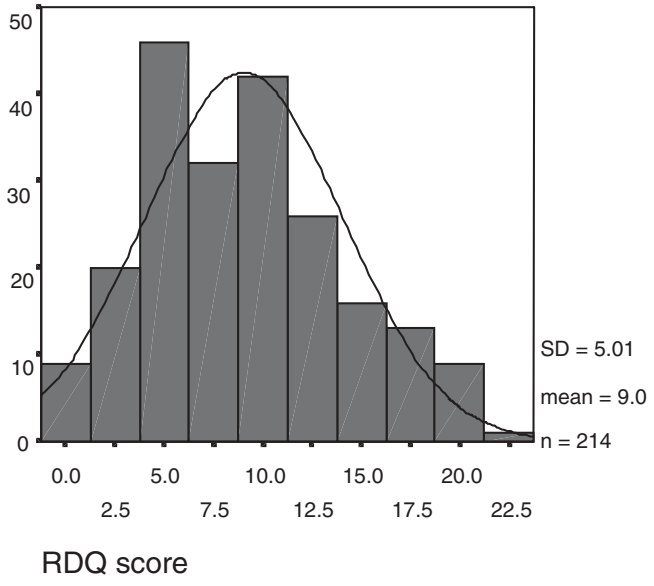

Fig. 1. Roland-Morris Disability Questionnaire (RDQ) score distribution

Validity

A principal component analysis was conducted to confirm the one-dimensionality of the RDQ. The eigen value for the first component was 7.9. The one-dimensionality was found to be strong as a result of a substantial difference between it and the second component (Fig. 3). When looking at the factor loading for each item, it was found that the loading (the correlation with the total score) for question 2 ("I change position frequently to try to get my back comfortable") was low at 0.09. The other items exhibited a correlation of 0.4 or higher, which was set as the standard (Table 2). However, for investigation of the internal consistency using the aforementioned Chronbach's α, the α did not rise even when question 2 was omitted.

The correlation (*s*) between the RDQ score and the subscale of the SF-36 scale ranged from 0.36 to 0.62. The strongest correlation was observed in "physical functioning," followed by "role-physical," and "bodily pain." The correlation between "mental health" and "vitality" was somewhat weak. These results support the hypotheses that had been set down in advance (Table 3).

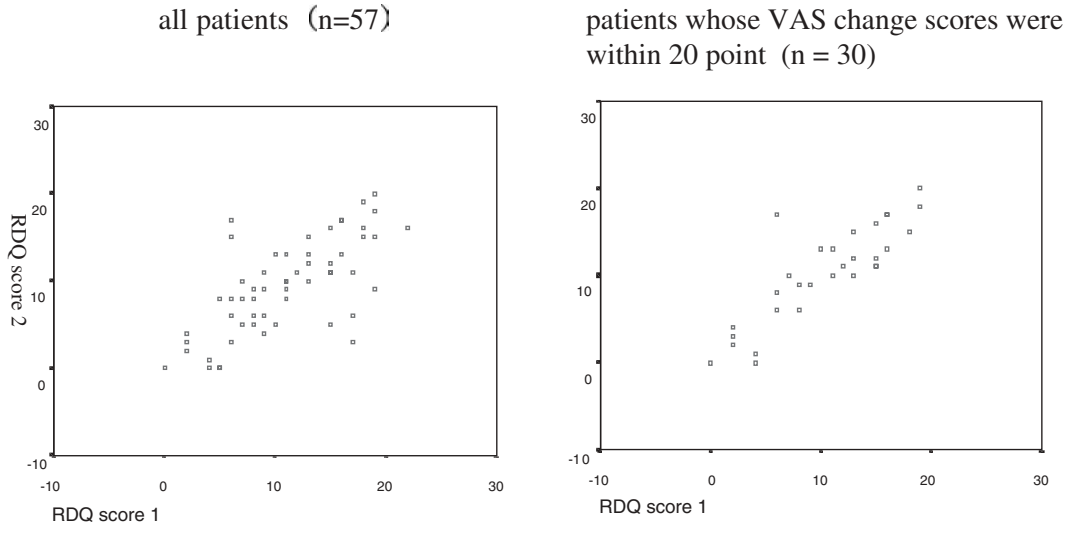

Fig. 2. Scatter plot of RDQ score on the baseline and second point

A difference in age was present between men and women. Therefore, when the RDQ scores were compared by gender, an RDQ score adjusted by age for men and women was calculated. A gender comparison was conducted based on the difference in the mean values. The score was 8.1 (SD 0.45) for men and 10.3 (SD 0.48) for women, with the score for women found to be significantly higher. This finding means that women experienced a higher level of disability, which was contrary to our hypothesis. The correlation between the RDQ score and age was weak (0.223). However the correlation with age was strong for those 60 years of age and older (Fig. 4).

When the correlation between the RDQ score and the degree of pain was examined, correlations were observed as moderate or higher for patient pain rating, patient global rating, physician global rating, and the SF-36 bodily pain score (Table 4). Even though the SF-36 bodily pain score is composed of only two items, a high correlation was observed between it and the RDQ score. This result agrees with the results reported by Roland and Morris,[15] the authors of the RDQ.

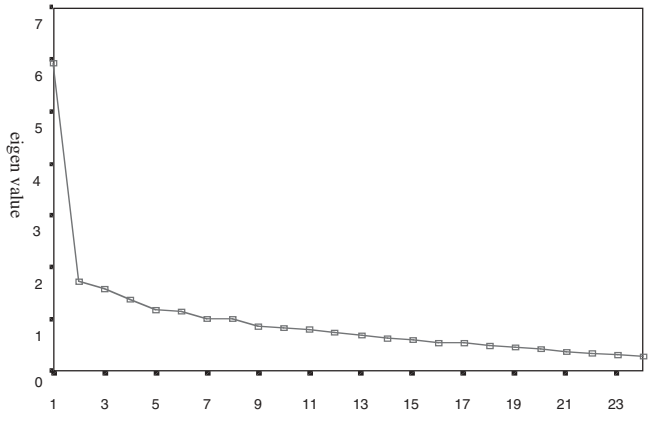

Fig. 3. Screen plot of the principal component

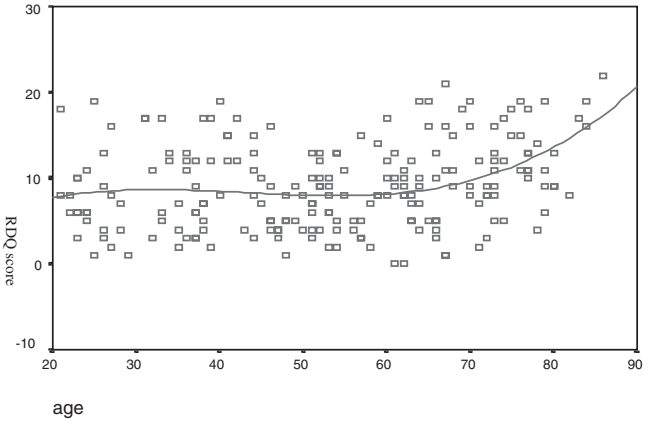

Fig. 4. Scatter plot of age and RDQ score

Table 2. Factor loading (unrotated) of principal components

Question no.	Item	Loading
Q3	I walk more slowly than usual because of my back.	0.70
Q23	Because of my back, I go upstairs more slowly than usual.	0.68
Q17	I only walk short distances because of my back.	0.67
Q7	Because of my back, I have to hold on to something to get out of an easy chair.	0.63
Q10	I only stand for short periods of time because of my back.	0.62
Q21	I avoid heavy jobs around the house because of my back.	0.61
Q5	Because of my back, I use a handrail to get upstairs.	0.60
Q1	I stay at home most of the time because of my back.	0.59
Q20	I sit down for most of the day because of my back.	0.55
Q4	Because of my back, I am not doing any of the jobs that I usually do around the house.	0.52
Q12	I find it difficult to get out of a chair because of my back.	0.51
Q9	I get dressed more slowly than usual because of my back.	0.50
Q11	Because of my back, I try not to bend or kneel down.	0.49
Q14	I find it difficult to turn over in bed because of my back.	0.45
Q8	Because of my back, I try to get other people to do things for me.	0.42
Q6	Because of my back, I lie down to rest more often.	0.41
Q22	Because of my back pain, I am more irritable and bad tempered with people than usual.	0.41
Q19	Because of my back pain, I get dressed with help from someone	0.37
Q18	I sleep less well because of my back.	0.37
Q24	I stay in bed most of the time because of my back.	0.36
Q15	My appetite is not very good because of my back pain.	0.30
Q16	I have trouble putting on my socks (or stockings) because of the pain in my back.	0.26
Q13	My back is painful almost all the time.	0.21
Q2	I change position frequently to try to get my back comfortable.	0.09

Table 3. Correlation between the RDQ score and SF-36 subscale scores

Parameter	*r*
Physical functioning	−0.62
Role-physical	−0.54
Bodily pain	−0.51
General health	−0.46
Vitality	−0.28
Social functioning	−0.44
Role-emotional	−0.41
Mental health	−0.36

r, correlation coefficient

Table 4. Correlation between the RDQ score and evaluation of pain

Parameter	*r*
Pain rating (patient)	0.29
Global rating[a] (patient)	0.40
Global rating (physician)	0.25
SF-36: bodily pain	−0.51

[a] Patient's global rating of the impact of low back pain on daily activities

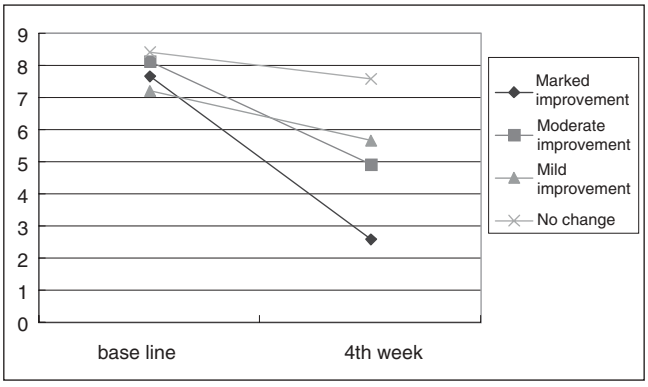

Fig. 5. Change in the RDQ score by improvement level

Responsiveness

The responsiveness of the scale was examined by comparing the baseline data and the data collected 4 weeks after the start of drug therapy for new patients. The improvement, as assessed by a physician 4 weeks after the start of drug therapy, was as follows: "marked improvement" for 56 patients (42.7%), "moderate improvement" for 36 patients (27.5%), "mild improvement" for 24 patients (18.3%), and "no change" for 15 patients (11.5%). When the mean RDQ score was compared at the two points, the means were 7.8 at baseline and 4.2 at 4 weeks; the RDQ score overall had become significantly lower. This lower score indicates a reduction in the level of disability.

The respondents were divided into four groups based on final global improvement, and a comparison was made between the baseline and 4-week RDQ scores. Whereas the scores at 4 weeks for the patients in the marked, moderate, and mild improvement groups became significantly lower ($P < 0.05$), the difference was not significant among the patients in the no-change group (Fig. 5).

Discussion

A Japanese version of the RDQ was created that conforms to the psychometric standards in the areas of reliability, validity, and responsiveness. This scale measures the degree of disability experienced in daily life as the result of low back pain, with scores ranging from 0 to 24. A higher score indicates a greater level of disability.

The 24 items in the RDQ can be answered with either "yes" or "no" to minimize any difficulty with responses. It took respondents an average of about 3 min to answer the questions in a pilot test that was conducted prior to the validation study, which indicated that the questionnaire was easy to understand. The potential does exist for a low degree of precision in the scale because "yes" and "no" are the only possible responses. However, the results of this study indicated that this scale does distinguish differences in clinical criteria and symptoms because the RDQ scores for the respondents exhibited sufficient variation. Furthermore, the RDQ score exhibited not only a strong correlation with the physical domain of the SF-36 (physical functioning, bodily pain, role of physical health) but a strong correlation with social functioning and mental health. These results demonstrated that the RDQ measures the important elements that make up health-related QOL, including not only physical activities but also the impact of low back pain on role/social functioning and the mental health of the patient. The RDQ score changed corresponding to the degree of improvement achieved through intervention. All of these results taken together show that the Japanese version of the RDQ is useful for measuring and quantifying the impact of low back pain on daily activities; moreover, it was demonstrated that the RDQ has the reliability, validity, and responsiveness required of a scale.

Our scale, which is made up of 24 items, exhibited high one-dimensionality, and there was a low item-scale correlation observed only with item 2. Although this finding did not have a major impact on the overall scale composition and scoring, it still merits further investigation.

It is possible to assess the outcome of patients with low back pain using this RDQ scale from the standpoint of not only the degree of pain but also the impact on the daily activities of the patient. We expect that use of this scale in Japan to assess treatment by the patients themselves will contribute to meaningful improvement of outcome for patients undergoing treatment for low back pain.

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