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CROSS-CULTURAL ADAPTION OF THE MANNICHE QUESTIONNAIRE FOR GERMAN-SPEAKING LOW BACK PAIN PATIENTS

Martin J. Nuhr,[1] Richard Crevenna,[1] Michael Quittan,[1] Alexandra Auterith,[2] Günther F. Wiesinger,[1] Thomas Brockow,[3] Peter Nuhr,[4] Veronika Fialka-Moser,[1] Andrew Haig[5] and Gerold Ebenbichler[1]

From the [1]Department of Physical Medicine and Rehabilitation, University of Vienna, Vienna General Hospital, Vienna, [2]Department of Medical Statistic, University of Vienna, Vienna, Austria, [3]Spa Medicine Research Institute, Bad Elster, Germany, [4]Nuhr-Zentrum, Spa Medicine Resort, Senftenberg, Austria and [5]Department of Physical Medicine and Rehabilitation, University of Michigan, Ann Arbor, Michigan, USA

Objective: **To develop and validate a cross-cultural version of the Manniche Low Back Pain Rating Scale (MRS) for use in German-speaking low back pain patients.**

Background: **Clinical intervention research in back pain would be enormously facilitated if a small number of relevant, patient-centred questionnaires became internationally used. MRS seems to be particularly suitable for cross-cultural adaptation due to its coverage of multidimensional back pain-specific health domains.**

Methods: **MRS was translated and back-translated, pretested and reviewed by a committee. The German version was tested in 126 patients with low back pain from all countries of German-speaking Europe. Reliability (subsample $n = 20$), dimensionality and construct validity was assessed. Single-dimensionality, higher correlations of MRS with the physical scales compared with the mental scales of the MOS SF-36, a moderate to good correlation with the Roland Morris Questionnaire and a low correlation with the Finger Floor Distance were hypothesized.**

Results: **Spearman's Rho for test-retest reliability was 0.98 ($p < 0.001$); Cronbach's alpha 0.95. Factor analysis revealed only 1 factor with an Eigenvalue >1 [3.25]. MRS was strongly correlated with the Roland Morris Questionnaire ($r = 0.91$), and slightly correlated with the Finger Floor Distance ($r = 0.23$). Correlations of MRS with domains of the SF-36 "Physical Functioning", "Role Physical" and "Bodily Pain" were higher (r −0.66 to −0.72) than with "Role Emotional", "Mental Health" and "Social Functioning" (r −0.34 to −0.61).**

Conclusion: **The German version of the MRS seems to be reliable, uni-dimensional and construct valid for the assessment of functional status in German-speaking low back pain patients.**

Key words: Manniche score, low back pain, translation, German-speaking.

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Correspondence address: Martin J. Nuhr, Department of Physical Medicine and Rehabilitation, University of Vienna, Vienna General Hospital, Waehringer Guertel 18-20, A-1090, Vienna, Austria.
E-mail: martin.nuhr@univie.ac.at

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INTRODUCTION

Disabling low back pain (LBP) with and without sciatica is a major public health concern. In many countries it is the most common cause of long-term disability in middle age (1). Chronic low back pain, in particular, is a major cause of medical expenses, absenteeism and disablement (2). It has been estimated that approximately 5–10% of LBP patients become chronically disabled and account for about 90% of the costs (3, 4). Most LBP syndromes lack a specific diagnosis (5, 6) and there seems to be no correlation between findings on radiography and LBP (7, 8). Chronic LBP with and without sciatica is resistant to individual non-operative treatment. Patients are often referred for multidisciplinary treatment or rehabilitation. Multidisciplinary approaches to chronic pain are predicated on grounds of a conceptual shift away from a restricted biomedical model and towards a multifactorial model of interrelating physical, psychological and social/occupational factors (9).

Multidisciplinary rehabilitation approaches for LBP are based on the multidimensional model of the International Classification of Functioning, Disability and Health (ICF, formerly the ICIDH) (10).

During the past 10–15 years, outcome evaluation of health status has become increasingly important compared with physiological or laboratory tests in determining the value of therapeutic regimes. The assessment of functional health in a multidisciplinary rehabilitation program of patients with chronic LBP with and without sciatica (lumbar radicular syndrome) is the basis for diagnosis, intervention and outcome evaluation in these patients. This is especially true in health services and health education research. Managed care and pressures for cost containment continue to grow. A validated assessment instrument is clearly essential for identifying and addressing the core deficits of an impaired patient, for monitoring the outcome of the multidisciplinary bio-psychosocial rehabilitation programs in daily rehabilitation practice, and in any controlled clinical investigation.

Condition-specific outcome instruments for assessing LBP are widely distributed, translated and validated in different languages. Examples are the Roland-Morris Questionnaire (11) or the Oswestry low back pain disability questionnaire (12). These standardized self-reported questionnaires provide a

convenient method of collecting and synthesizing a large amount of information on pain-related activity limitation. Brevity, the fact that they are simple to complete, readily understood by patients, and that there is evidence of their scientific validity has led to their widespread use.

The above-mentioned patient-oriented outcome measures, however, share a common flaw as they do not measure concepts such as impairments (problems in body functions or body structure), except pain, nor do they give appropriate weight to participation restrictions. For example, only 1 item in the Roland Morris Questionnaire (Item 22) and 2 items in the Oswestry Questionnaire (Items 9 and 10) can be unambiguously assigned to participation. Moreover, most of the treatment regimens for LBP target the improvement of impaired function parameters such as pain, range of motion and muscle function. In LBP patients, activity levels usually improve as a consequence when function parameters have improved.

The Manniche Low Back Pain Rating Scale (MRS) was developed as a comprehensive assessment tool according to the ICF concept for patients with LBP with disc herniation. It measures the health concepts of pain and other functional limitations as well as limitations in activity and participation, which was described by the authors of the original version as pain, disability and physical impairment (13). The authors assumed that the combination of limitations of function with pain (back pain, leg pain, analgesic consumption), back muscle endurance, spine mobility and patient's mobility reflect the most important domains for LBP (13). Linking the constructs of the MRS to the ICF (14), the assessments for pain, back muscle endurance, back mobility and sleep (Item 1 of the disability index) can be related to ICF-categories within the "body functions" component. All other MRS-health constructs can be linked to categories within the "Activities and Participation" component. In particular, items 2–11 of the disability index and patient's mobility can be assigned to activities, and items 12–14 (impact of LBP on family, contact with other people, jobs) to participation. Item 15 (impact of LBP on future) can be related to activities, participation or both; thus a subdivision does not seem reasonable.

As the MRS seems to have a high content validity, a wide distribution of this instrument in clinical studies and in daily practice should be attempted. Therefore the purpose of this study was to translate and test the adequacy of the German-language version of the MRS in terms of reliability, dimensionality and validity in a cross-sectional design.

German-speaking people in Europe are a heterogeneous group living in 3 different countries. In approximate terms, there are 80 million Germans, 8 million Austrians and 4.5 million German-speaking Swiss. Because these people represent different regions of Europe, there are variations in their spoken and written German. Consequently, German speakers from different countries use different colloquialisms, give different meanings to some of the same words, or use completely different words to name the same object. Thus a careful translation is necessary, as is the choice of the appropriate method(s) of translation (15, 16). For the translation process recent published guidelines for cross-cultural adaption were used (16).

MATERIAL AND METHODS

Manniche Rating Scale

The MRS represents an index scale, a compilation of several separate illness components, which should measure only 1 underlying dimension. Rater agreement, dimensionality, criteria-related validity and construct validity were examined in the original version (13).

Translation of questionnaire

The questionnaire was translated from English into German by 2 independent native German-speakers, thus allowing detection of errors and divergent interpretations of items with ambiguous meaning in the original instrument. To obtain a better idiomatic and conceptual rather than literal equivalence between the 2 versions of the questionnaire, and render the intended measurement more reliable, 1 of the translators was aware of the process purpose and the concepts involved in the instrument. The other translator was unaware of the translation objective. This was useful in eliciting unexpected meanings from the original tool.

In a second step 2 bilingual professional translators (mother tongue English), with no prior knowledge of the MRS, independently back-translated German versions into English. Since the back-translators were not aware of the intent and concepts underlying the material, they were free of bias and expectations, so that their back-translation might reveal unexpected meanings or interpretations in the final version (15). A constituted review committee (3 physiatrists, 1 rheumatologist, 1 psychologist, 1 physiotherapist and 1 masseur) compared the various translations and back-translations to the original. The committee reviewed all instances of disagreement, and then formed a consensus on final recommendations. This German version was then pre-tested by 20 patients with LBP and 2 children aged 12 years in order to document that this version could also be understood by a person with limited educational ability. On the basis of their comments, very few minor revisions were made. These were "Einkaufstasche" instead of "Einkaufssack" (shopping bags, item 5) and "Kontakt abbrechen" (item 13) was replaced by "weniger Kontakt" ("… give up contact …", item 13). The genetive use in items 8, 9 and 10 "… wegen des Kreuzschmerzes …" ("… because of …") was replaced by "… aufgrund von …". The definitive version was developed by the constituted review committee. The structure of the questionnaire was not changed and the items were maintained. However, we have changed the numeric 11-point box pain rating scales of the original version to coloured visual analogue scales. The German version of the MRS is shown in the Appendix.

Patients

Table I summarizes the demographic characteristics of the study population. A total of 126 patients completed the questionnaire. Their mean age was 60 years, range 20–87 years, 53% (67/126) of the patients were female. All patients suffered from LBP and 31 patients (25%) also suffered from leg pain. A total of 60 patients with LBP showed major degenerative findings on radiography, whereas 66 patients showed either a disc herniation in MRI ($n = 41$) or had undergone surgery for disc herniation ($n = 25$). A total of 4 patients with LBP (7%) with degenerative findings reported leg pain, whereas 27 of the 66 patients (41%) with disc herniation or Failed Back Surgery Syndrome reported leg pain, respectively. There were no significant differences between the patients of the 3 countries (all $p > 0.05$; Kruskal-Wallis test).

The study was conducted at the Nuhr-Zentrum, a Spa and Rehabilitation resort (health centre) in Senftenberg, Austria, which is visited by patients from all countries of German-speaking Europe and has contracts with different public healthcare providers in Austria, Germany and Switzerland. After patient information was handed out and verbal informed consent obtained, 126 patients with either LBP alone or low back pain and sciatica were consecutively enrolled in the study over a period of 4 months.

Table I. *Demographic characteristics of study population*

	Austrian (n = 47)	German (n = 66)	Swiss (n = 13)	Total (n = 126)
Sex (F/M)	23/24	37/29	7/6	67/59
Age, mean (SD) (years)	57 (14)	61 (13)	62 (14)	60 (13)
Weight, mean (SD) (kg)	77 (18)	80 (22)	74 (19)	78 (20)
Height, mean (SD) (metres)	1.71 (0.1)	1.70 (0.08)	1.72 (0.09)	1.70 (0.09)
Marital status (single/married/divorced/widowed)	8/29/3/7	8/51/2/5	0/9/0/4	16/88/5/16
Leg pain (yes/no)	13/34	16/50	2/11	31/95
Diagnosis (degenerative/disc herniation/failed back surgery syndrome)	16/16/15	37/21/8	7/4/2	60/41/25
Occupation (employed/self-employed/retired/unemployed)	13/18/15/1	24/13/26/3	3/4/6/0	40/35/47/4
History (trauma/no trauma)	16/31	8/58	2/11	26/100
Sport activity (regular/sometimes/never)	12/7/28	16/20/30	4/1/8	32/28/66
Pain duration (months)	24.6 (26.6)	24.7 (23.5)	33.2 (26.63)	25.5 (24)

To achieve a better comparability between the results of the present evaluation and the original version of the Manniche questionnaire, we have formed radiological subgroups of patients with LBP (degenerative changes, disk herniation, lumbar surgery).

Reliability

For self-rated tests, the test-retest reproducibility is assessed by administering the scale on 2 occasions, separated by a time interval that is sufficiently short for us to assume that the variable being measured has not changed (17). In this investigation we used a time interval of 24 hours. Thus, patients tested in the morning were also re-tested on the following morning. Twenty consecutive patients were asked to complete a second questionnaire after 24 hours at the facility. The internal consistency for this measurement was assessed with Cronbach's alpha (18). Cronbach's alpha is used to calculate the mean of all possible split-half combinations (19). The internal consistency of a scale relates to its homogeneity.

Dimensionality

Dimensionality was evaluated by principal-component-factor analysis including back pain, leg pain, disability and physical impairment as standardized variables. Corresponding to the original version, we expected only 1 factor with an Eigenvalue >1 and similar factor loadings for the variables included in the model.

Validity

Construct validity was measured by assessing the correlations between MRS and the German version of the Roland Morris Questionnaire (20), MRS and MOS-SF-36 (21), as well as MRS and the forward bending test. Because we hypothesized that MRS covers a broader concept of LBP than the Roland Morris Questionnaire, we expected only a moderate to good correlation. Additionally, we assumed, that MRS correlates higher with the domains "most physical" scales (Physical Functional, Role Physical, Bodily Pain) of the SF-36 than with the "most mental" scales (Role Emotional, Mental health, Social Functioning) (22, 23). Lastly, we expect only a low correlation between MRS and the forward bending test, because mobility represents only 1 category of the MRS-construct.

The forward bending test (24) examines the distance from the middle finger to the floor with a tape during forward bending of the trunk with the knees, arms and fingers fully extended. All patients were evaluated by the same physician after completing the questionnaires.

Statistical analysis

All variables are described as mean (standard deviation). For analysis of reliability and validity Spearman correlation coefficients were calculated in all cases because the assumption of normally distributed data might not be justified for all data. For between-group comparisons Kruskal Wallis tests were used.

RESULTS

In Table II, total scores and subscores of the MRS, Roland Morris Questionnaire and MOS-SF-36 are compared between LBP patients with degenerative findings and LBP patients with disc herniation and Failed Back Surgery Syndrome. The sum scores of the leg pain ratings were 10.97 (SD 5.65). Patients with LBP with leg pain reported more pain in their backs than those without leg pain (20.06 (SD 8.27) vs 9.84 (SD 5.87), $p < 0.0001$; Kruskal Wallis test).

Test-retest reliability

Test-retest reliability for the MRS total score is described in Fig. 1, where the difference between the first and second measurements is shown depending on the average. The average difference of the MRS was −0.89 (SD 1.97). The mean of absolute differences is 0.56 (SD 0.32) for VAS, 0.9 (SD 1.41) for disability and 0.2 (SD 0.52) for physical impairment. Internal consistency reached a Cronbach's alpha of 0.95 with coefficients ranging from 0.94 to 0.95.

Dimensionality

The principal-component factor analysis revealed only 1 factor with an Eigenvalue >1, explaining 81% of the total sample variance. All included variables loaded highly on this factor (Table III).

Construct validity

The Spearman correlation coefficients between MRS total score and MRS-subscores and Roland Morris Questionnaire revealed strong associations (Table IV). Such correlations between MRS total and Roland Morris Questionnaire did not differ significantly between patients with degenerative disorders of the spine and patients with disc herniation or Failed Back Surgery Syndrome ($p = 0.13$) (25). (Correlations between Manniche total rating score (subscores respectively) and the MOS total score (subscores respectively) in all patients and in patients with different diagnosis can be obtained from the

Table II. *Burden of disease measured by the Manniche Low Back Pain Rating Scale (MRS), Roland Morris Questionnaire (RMQ), and MOS SF36 and burden of disease in the subjects with and without radiological features*

	Burden of disease in all patients ($n = 126$)		Burden of disease in "Patients with degenerative findings" ($n = 60$)		Burden of disease in LBP "Patients with disc hernation/FBSS" ($n = 66$)		
	Mean (SD)	Median	Mean (SD)	Median	Mean (SD)	Median	*p*
Manniche Total	44.7 (25.3)	36.3	39.1 (19.4)	34.8	50.1 (28.7)	45.5	
Manniche VAS	15 (12.3)	10.1	11.2 (7.8)	9	18.6 (14.4)	11.4	0.01
Manniche Back pain	12.4 (7.8)	10	10.6 (6.6)	9	13.9 (8.6)	10.5	
Manniche Leg pain	2.7 (5.4)	0	0.54 (2.6)	0	4.6 (6.6)	0	0.001
Manniche Disability	12.2 (7)	11	11.4 (6.3)	11	12.9 (7.7)	11.5	
Manniche Physical impairment	17.5 (7.4)	17.5	16.5 (6.6)	16	18.4 (7.9)	19	
RMQ	7.75 (5.6)	6	6.49 (4.53)	6	8.9 (6.3)	7	
MOS Total	467 (156)	494	471 (144)	489	460 (165)	496	
MOS General health perception	55.4 (20.8)	55	55.2 (18.53)	52	55.1 (22.6)	56	
Finger Floor Distance (cm)	8.5 (9.5)	7	8.7 (9.11)	7	8.3 (10.1)	7	
MOS Mental health index	65 (17.8)	68	65.3 (17.9)	68	64.3 (17.6)	68	0.05
MOS Pain	43.3 (19.8)	42	47.1 (18.06)	51	39.5 (20.7)	41	
MOS Physical functioning	60.2 (25.6)	67.5	61.3 (24.24)	70	59.0 (27.0)	62.5	
MOS Role emotional	74.3 (40.4)	100	71.8 (42.80)	100	76.2 (38.6)	100	
MOS Role physical	51.8 (42.2)	50	49.2 (43.54)	50	53.4 (41.1)	50	
MOS Social functioning	70.6 (26.1)	75	73.1 (24.98)	75	67.9 (27.1)	75	
MOS Vitality	47.1 (18.2)	50	49.1 (16.41)	50	44.9 (19.3)	47.5	

Burden of disease in the subgroups classified according to findings on X-ray or MIR as measured by the MRS, RMQ and MOS SF36 (p-values ≤ 0.05 are given).

corresponding author on request.) Associations between MRS and Physical Functioning, Role Physical, and Bodily Pain of the SF-36 were higher (r −0.66 to −0.72; $p < 0.001$) than for Mental Health, Role Emotional, and Social Functioning (r −0.34 to −0.61; $p < 0.001$).

The Spearman correlation coefficient between the MRS (total score) and the finger floor distance was $r = 0.07$ ($p = 0.46$). The correlations between the finger floor distance and the Manniche subscores were for pain $r = 0.11$ ($p = 0.22$), disability $r = 0.04$ ($p = 0.71$) and physical impairment $r = 0.05$ ($p = 0.60$), respectively.

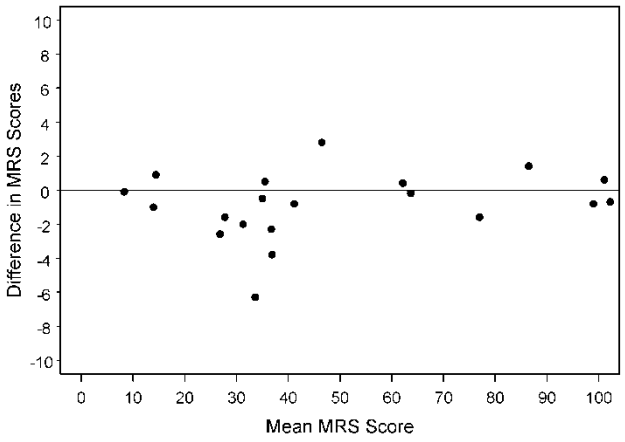

Fig. 1. Test-retest reliability for the Manniche Low Back Pain Scale (MRS) total score. The difference between the first and second measurements is shown depending on the average. (Altman and Bland).

DISCUSSION

This study investigated the translation into German and evaluation of a well-known LBP outcome measure. Although German and English are linguistic relatives, most questions required a different phrasing to avoid misunderstanding and to guarantee idiomatic equivalence. In addition, the instrument appears to be understood and easily administered to German-speaking groups of varied national origin living in different regions in Europe. The structure of the questionnaire was not changed and the items were maintained. However we have changed the numeric 11-point box pain rating scales of the original version to coloured visual analogue scales. These

Table III. *Results of the principal-component factor analysis*

Factor number	Eigenvalue[a]	Cumulative percentiles[b]
1	3.25	81.32
2	0.44	92.42
3	0.18	96.93
4	0.12	100.00
Variable	Factor loading[c]	Communality[d]
Back pain	0.93	0.86
Leg pain	0.71	0.52
Disability	0.93	0.87
Physical impairment	0.90	0.80

[a] The latent dimension is usually taken to be equal to the number of Eigenvalues that are >1.0.
[b] Explained variation given inclusion of this factor.
[c] Correlation between the manifest component and the unidimensional independent low back pain variable.
[d] Explained variation of the independent low back pain variable.

Table IV. *Correlation between Roland Morris Score (RM) and Manniche total score (MRS total), and Manniche Subscores: Pain (MRS-VAS), Disability (MRS-disability) and Physical impairment (MRS-Physical impairment) subscores. Correlation coefficients are in first row, p-values in second row*

Spearman correlation coefficients Prob >|r| under H0: Rho = 0			
	RM All patients (n = 126)	RM Patients with degenerative findings (n = 60)	RM Patients with disc herniation/ FBSS (n = 66)
MRS (Total)	0.90735 < 0.0001	0.86675 < 0.0001	0.92121 < 0.0001
MRS – VAS	0.88957 < 0.0001	0.85832 < 0.0001	0.90409 < 0.0001
MRS – Disability	0.90766 < 0.0001	0.89929 < 0.0001	0.91355 < 0.0001
MRS – Physical impairment	0.79756 < 0.0001	0.69238 < 0.0001	0.84704 < 0.0001

coloured visual scale ratings are widely used in clinical practice, are easy to perform and have proven more exact and reliable in the estimation of pain than box pain rating scales (26). The original version of the MRS was evaluated for patients suffering from chronic low back pain with and without leg pain after first-time lumbar surgery without re-operation (13). We have chosen this instrument for the following reasons: (i) favourable results of the evaluation of patients with LBP in the original version; and (ii) a higher content validity of MRS compared with the Roland Morris Questionnaire or Oswestry Questionnaire, operationalized by linking the health constructs of the 3 outcome measures to the ICF (14).

Our results suggest that this translated instrument is both reliable, uni-dimensional and construct valid. The German version of the MRS showed similar psychometric properties to the original English version (27). Internal consistency and test-retest reliability were high, but some overestimation of test-retest reliability seems to be likely, because of possible recall bias within a 24-hour time period. Reliability did not change within subgroups. Corresponding to the original, only 1 factor with an Eigenvalue > 1 and similar factor loadings on pain, disability and physical impairment was found. This enables simple addition of the 3 MRS-scores.

MRS correlates strongly with Roland Morris Questionnaire, both in the overall-population and the radiological subgroups. This indicates that both MRS and Roland Morris Questionnaire measure 2 highly interrelated constructs or even the same construct for the surveyed populations. The more pronounced multidimensional approach of the MRS compared with the Roland Morris Questionnaire could not be confirmed on an empirical, cross-sectional basis. However, the content differences between the 2 instruments might be reflected by different responsiveness in a longitudinal head to head comparison with a multidisciplinary rehabilitative intervention.

As expected, MRS shows higher correlations with the "most physical scales" compared with the "most mental scales" of the MOS-SF-36. The reverse constellation would have to be expected in mental disorders. The correlation between the total score of the MRS and finger floor distance test was low. Both results confirm the construct validity of the MRS.

Our study confirms findings from previous studies that it is possible to translate a comprehensive clinical assessment tool into German without losing the psychometric properties of the original (English) version (20, 28). Thus translating existing scales appears to be feasible, and is clearly much more efficient than developing a new scale. Since we were able to demonstrate the similarity of the instrument with respect to reliability and construct validity, a similar responsiveness for this German version of the MRS seems to be likely (29, 30). But ideally, this should be confirmed by a validation study in a longitudinal design. In such a study, test-retest reliability could be re-evaluated within a longer time interval for the subgroup of stable patients in order to minimize recall bias (31).

Longitudinal head to head comparisons are necessary to decide whether the MRS should be recommended as a further outcome measure, a substitute, or can be excluded from clinical back pain research. In those comparisons, MRS should be compared with widely accepted standards of back pain outcome measurement such as the Roland Morris Questionnaire or the Oswestry Questionnaire or the MOS-SF-36. A recent study showed that disease specific questionnaires were no better than the SF-36 in picking up changes in over 700 back pain patients (32). Ideally, head to head comparisons should be performed in different back pain populations and with different interventions (e.g. multidisciplinary intervention, physiotherapy, behavioural therapy, etc.) to determine the specific usefulness of each instrument. Further studies seem to be justified to assess the usefulness of the MRS compared with accepted standards.

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APPENDIX: GERMAN VERSION OF THE MRS: DISABILITY INDEX

Antwortmöglichkeiten:

Frage Nr.1 bis Nr.11:

ja = 0 Punkte; möglicherweise ein Problem = 1 Punkt; nein = 2 Punkte;

Frage Nr.12 bis Nr.15:

ja = 2 Punkte; möglicherweise ein Problem = 1 Punkt; nein = 0 Punkte;

	Ja	möglich	Nein
Können Sie in der Nacht ohne Kreuzschmerzen durchschlafen?			
Können Sie Ihrer täglichen Arbeit nachgehen, ohne dass Kreuzschmerzen Ihre Tätigkeiten beeinträchtigen?			
Können Sie einfache Arbeiten im Haushalt erledigen, wie Blumen gießen oder den Tisch abwischen?			
Können Sie Schuhe und Strümpfe ohne fremde Hilfe anziehen?			
Können Sie 2 volle Einkaufstaschen (insgesamt 10 kg) tragen?			
Können Sie sich aus einem bequemen Lehnsessel ohne Schwierigkeiten erheben?			
Können Sie sich beim Zähneputzen über das Waschbecken beugen?			
Können Sie die Treppe von einem Stockwerk in das nächste steigen, ohne dass Sie aufgrund von Kreuzschmerzen rasten müssen?			
Können Sie 400 Meter gehen, ohne dass Sie aufgrund von Kreuzschmerzen rasten müssen?			
Können Sie 100 Meter laufen, ohne dass Sie aufgrund von Kreuzschmerzen rasten müssen?			
Können Sie ohne Kreuzschmerzen Rad- oder Autofahren?			
Beeinflussen Ihre Kreuzschmerzen Ihre emotionale Beziehung zu Ihren engsten Familienmitgliedern?			
Hatten Sie in den letzten 2 Wochen aufgrund von Kreuzschmerzen weniger Kontakte mit anderen Personen?			
Wen es im Augenblick wichtig wäre, glauben Sie, dass es Berufe gäbe, die Sie aufgrund Ihrer Kreuzschmerzen nicht ausüben könnten?			
Glauben Sie, dass der Kreuzschmerz Ihre Zukunft beeinflussen wird?			