Original Article

Validation of the German Version of the Brief Pain Inventory

Lukas Radbruch, MD, Georg Loick, MD, Peter Kiencke, Gabriele Lindena, DVM, Rainer Sabatowski, MD, Stephan Grond, MD, Klaus A. Lehmann, MD, and Charles S. Cleeland, PhD

Department of Anesthesiology (L.R., G.L., R.S., S.G., K.A.L.), University of Cologne, Cologne, Germany; Mundipharma GmbH (G.L.), Limburg, Germany; Department of Medical Statistics, Informatics and Epidemiology (P.K.), University of Cologne, Cologne, Germany; and Pain Research Group (C.S.C.), University of Texas, Anderson Cancer Center, Houston, Texas, USA

Abstract

The Brief Pain Inventory is a comprehensive instrument for pain assessment and has been validated in several languages. A validated German version was not available until now. From March to May 1995 all outpatients of the pain clinic of the Department of Anesthesiology completed a questionnaire with the German versions of the Brief Pain Inventory (BPI) and the SF-36 quality-of-life questionnaire. The BPI was repeated after the consultation. The physician assessed the performance status score of the Eastern Cooperative Oncology Group (ECOG). The questionnaire was completed by 151 patients. Forty-two patients were excluded from evaluation for methodological reasons, so 109 patients were evaluated. As in the original version of the BPI, factor analysis showed a common factor for pain intensity and a second factor for pain-related interference with function. The comparative fit index of 0.86 confirmed this model. Responses before and after consultation correlated closely for the sum scores of the pain intensity items (Perarson correlation $r = 0.976$) as well as for the interference with function items ($r = 0.974$). Pain intensity in the BPI correlated with bodily pain in the SF-36 ($r = 0.585$). Sum scores of the pain interference items were higher in patients with deteriorated ECOG performance status, whereas sum scores of the intensity items were not changed. Validity and reliability of the German BPI were comparable to the original version. The BPI may be advantageous for palliative care patients, as it places only a small burden on the patient and offers easy criteria for evaluation. However, further research is needed to differentiate the impact of pain-related and disease-related interference with function on the BPI, and to find an algorithm for the evaluation of the BPI when values are missing. J Pain Symptom Manage 1999;18:180–187. *© U.S. Cancer Pain Relief Committee, 1999.*

Key Words

Pain assessment, Brief Pain Inventory, quality of life, performance status

Introduction

Pain is a subjective sensation, and pain assessment ideally should not rely on a single question. Questionnaires for a comprehensive evaluation of pain syndromes have been developed, but patients with severe pain may not be

Address reprint requests to: Lukas Radbruch, MD, Klinik für Anästhesiologie und Operative Intensivmedizin, Universität zu Köln, 50924 Köln, Germany.

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able to use these instruments. To meet the need for an instrument to obtain estimates of pain prevalence and severity, the Brief Pain Inventory (BPI)[1,2] was developed to be easily administered to large numbers of patients. It was constructed as a compromise between the desire to assess as much as possible and the need to limit respondent burden. It is brief, self-administered, and easily understood.

The BPI contains questions on pain intensity and on pain-related interference with function. Validation of the BPI in different languages consistently demonstrated these two common factors.[3–5] In addition, the patient enters his pain localization on a body drawing and can give details of his current medication.

The BPI has been validated in several languages and has become established as a standardized instrument for multinational studies. Up to now, no validated German version has been published.

Methods

The original version of the BPI was translated to German and then back to English by a second investigator with English as his native-speaking language, who had not seen the original version. This retranslated version was compared to the original, and a revised second translation was made. After the second retranslation, an almost complete agreement was reached. The final version was established in consultation with the translators (see Appendix 1).

From March to May 1997, all outpatients in the pain clinic of the Department of Anaesthesiology of Cologne University completed a questionnaire with four parts. Patients gave informed consent for the study. Part 1 consisted of the German version of the BPI. Part 2 included the German version of the SF-36 quality-of-life questionnaire.[6,7] These parts were filled out in the waiting area. The responsible physician completed the performance status score of the Eastern Cooperative Oncology Group (ECOG)[8] in part 3 of the questionnaire immediately after the consultation, which usually took 30 to 60 minutes. Thereafter the patient completed part 4 (retest of the BPI).

Validity of the BPI was established with factor analysis, using a principal axis factor solution with a direct oblimin rotation. Model fit of

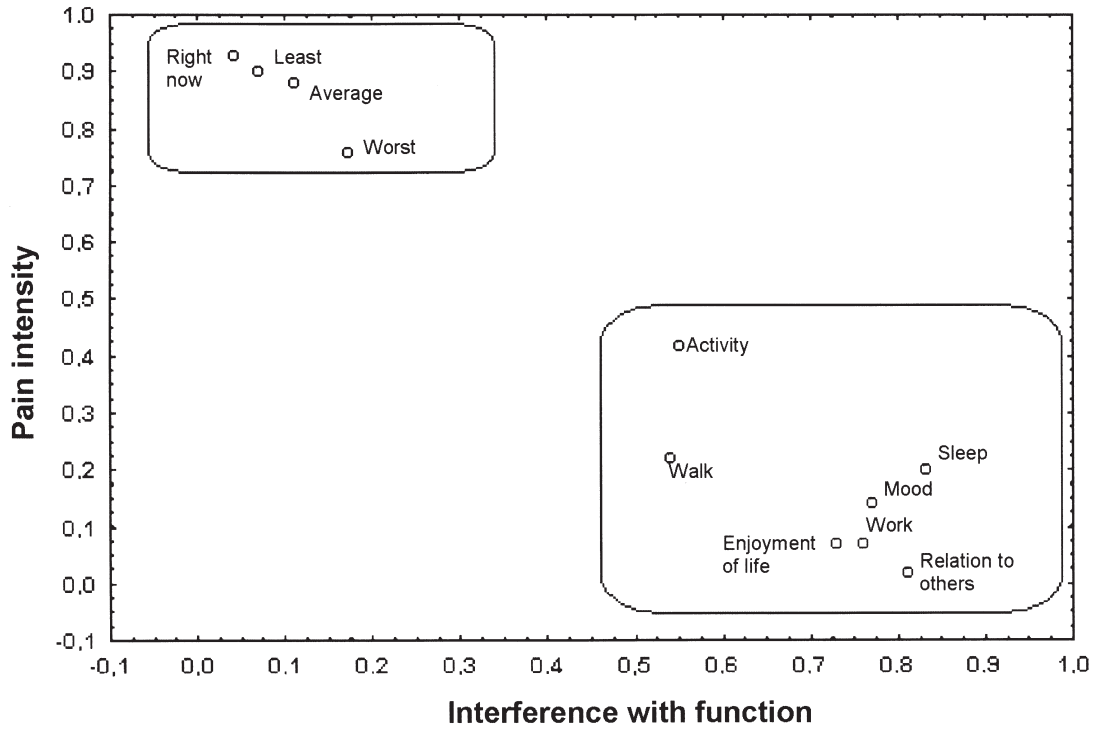

Fig. 1. Factor loading plot of the German version of the Brief Pain Inventory using two factors with an explained variance of 68.4%.

the factor solution was confirmed with the Comparative Fit Index.[9] The Comparative Fit Index compares the fit of an independent baseline model with the hypothetic factor model in relation to the degrees of freedom. It ranges between zero and one, with an index of one as an indicator of a perfect fit between the data an the hypothetic factor-structure. The Comparative Fit Index was calculated with the factor model derived from factor analysis (Figure 1) using the program EQS version 5.6 for calculation structural equation models. It was estimated that 110 patients would be needed for factor analysis of the pain intensity and interference items. Considering drop-outs and incomplete questionnaires, the inclusion of 150 patients was targeted. For investigation of convergent validity, the items of the BPI were correlated to the analogue domains of the SF-36. Criterion validity was represented by correlation with the ECOG performance status score. To assess the reliability of the BPI, coefficient alphas were calculated separately for the four pain intensity and the seven interference items. Test–retest stability of the coefficient alphas and alpha, if item deleted, was used as a measure for short-term stability. The number of missing values, of questions rated as difficult by the patients, and whether help was needed with completion of the questionnaire were used as measures of responsiveness and patient burden. The time needed for completion of the questionnaire was documented by the patients.

The study was approved by the Cologne University ethics committee.

Results

The questionnaire was completed by 151 patients (67 women, 84 men, mean age 55.9 years, range 27.6–83.9 years). Data from 42 patients were excluded from evaluation for methodological reasons. Thirty-four patients completed only parts of the questionnaire and were excluded. Five patients received invasive treatment with nerve blocks or intravenous titration with analgesics, and 3 patients received transcutaneous nerve stimulation. As these measures should have interfered with test–retest stability, these patients were also excluded. The remaining 109 patients were evaluated, 49 patients (45%) with cancer pain and 60 patients (55%) with chronic non-cancer-related pain syndromes.

Median time for completion of the BPI was 5 minutes. Cancer patients most frequently omitted the questions about pain interference with work and walking ability, and patients with nonmalignant pain omitted those about least pain intensity and about pain interference with mood and relations with others (Table 1). Nearly 80% of the patients answered the first part of the questionnaire with the BPI completely. Looking at those patients who filled out the questionnaire completely, only 5.5% found all questions difficult to answer. Another 6.4% reported difficulties with single questions of the BPI, most frequently the items "pain relief" and "relations with others". 14.7% of the patients needed help to complete the questionnaire.

As in the original version of the BPI, the items of worst, least, and average pain intensity, and pain intensity right now loaded on one common factor (pain intensity), whereas

Table 1
Missing Values in the First Administration of the Brief Pain Inventory to 151 Outpatients

	Cancer patients		Other patients		All patients	
	n	%	n	%	n	%
No items missing	53	77.9	67	80.7	120	79.5
1 item missing	5	7.4	6	7.2	11	7.3
2–9 items missing	4	5.9	6	7.2	10	6.6
All items missing	6	8.8	4	4.9	10	6.6
All patients	68	100	83	100	151	100

Table 2
Factor Loading for the German Version of the Brief Pain Inventory[a]

	Pain intensity	Interference with function
Worst pain	0.759	0.172
Least pain	0.897	0.069
Average pain	0.880	0.115
Pain right now	0.930	0.043
Activity	0.420	0.552
Mood	0.142	0.767
Walking	0.217	0.536
Work	0.070	0.757
Relations with others	0.023	0.812
Sleep	0.199	0.825
Enjoyment of life	0.074	0.729

[a]Extraction with main component analysis, oblimin rotation with delta = 0.

Table 3
Test–Retest Stability of the Brief Pain Inventory[a]

	Pearson correlation coefficients	α if Item deleted T1 α = 0.9152	α if Item deleted T2 α = 0.9251
Pain intensity			
Worst	0.961	0.9048	0.9224
Least	0.782	0.9096	0.9161
Average	0.861	0.8602	0.8715
Right now	0.934	0.8844	0.8995
		α if Item deleted	
Interference with function		α = 0.8819	α = 0.8926
Activity	0.854	0.8575	0.8679
Mood	0.826	0.8528	0.8704
Walking	0.912	0.8778	0.8950
Work	0.887	0.8568	0.8715
Relations with others	0.934	0.8619	0.8722
Sleep	0.930	0.8785	0.8889
Enjoyment of life	0.967	0.8683	0.8720

[a]T1: assessment at admission; T2: retest after consultation; first row: correlation of the values scored at T1 and T2; second and third row: coefficent alphas and alpha, if item deleted.

the items on pain interference with function loaded on a second factor (interference with function, Figure 1, Table 2). These two factors, with eigenvalues of 6.08 and 1.42, explained 68.2% of the variance. For this solution with two factors, a Comparative Fit Index of 0.860 (independence model chi 878.48, 55 degrees of freedom; factor model chi 158.25, 41 degrees of freedom) was calculated. The factor solution explained 36–95% of the variance of the single items. Scores for pain intensity and interference with function were correlated closely for cancer patients ($r = 0.695$), as well as for other patients ($r = 0.589$, all patients $r = 0.634$). In the factor loading plot (Figure 1), the worst pain item would be grouped with the interference items if only cancer patients were considered. Otherwise the plots showed no difference between cancer patients and other patients.

Table 4
Reliability (Correlation Alpha) of the Pain Severity and Interference Factors of the Brief Pain Inventory

	Severity α	Interference α
China	0.86	0.91
France	0.86	0.90
Germany	0.88	0.92
Italy	0.78	0.78
Philippines	0.80	0.86
USA	0.87	0.91

To assess the reliability of the German version of the BPI, the coefficient alphas were calculated for the pain severity and interference items. The coefficient alphas were high, indicating little errors of measurement. Values for alpha are also given if single items are deleted. These values are comparable to the overall value, suggesting that each item contributes to the factor (Table 3). The coefficient alphas are in the range of those values calculated for other countries (Table 4).

Reliability depends also on test–retest stability. Patients completed the BPI before and after treatment in our outpatient clinic, with at least 30 minutes between test (T1) and retest

Table 5
Correlation of the Brief Pain Inventory (BPI) with the Factors of the SF-36 Quality-of-Life Questionnaire

Pearson correlation coefficient	BPI Pain intensity	BPI Interference with function
Physical functioning	0.345	0.560
Physical role	0.293	0.350
Bodily pain	0.585	0.567
General health	0.413	0.542
Vitality	0.326	0.602
Social functioning	0.167	0.485
Emotional role	0.251	0.321
Mental health	0.278	0.475
Physical health	0.437	0.569
Mental health	0.322	0.501

Table 6
Analysis of Variance of the Factors of the Brief Pain Inventory with the Eastern Cooperative Oncology Group Performance Status (ECOG)

		ECOG			
		0	1	2	3/4
Pain intensity	mean	20.37	19.78	21.94	21.40
(sum score)	median	18.00	18.50	22.00	24.00
F = 0.326; p = 0.807	n	15	54	25	15
Interference with function	mean	27.90	30.19	38.17	42.34
(sum score)	median	22.00	28.00	38.50	44.00
F = 3.634; p = 0.015	n	15	54	24	15

(T2). Responses at T1 and T2 correlated closely for sum scores of pain intensity (Pearson correlation $r = 0.976$) and interference ($r = 0.974$). Coefficient alphas for the pain intensity and interference factors as well as the values for alpha if the items are deleted did not change with repeated testing (Table 3).

Criterion validity was assessed with the correlation coefficients of the factors of the BPI and the domains of the SF-36 (Table 5). Pain intensity correlated most closely with bodily pain in the SF-36, but not with physical or mental health. Interference with function correlated with bodily pain, but also with physical functioning, vitality, and general health, as well as with both physical and mental health summary scores of the SF-36.

Correlation of physical functioning and the interference factor of the BPI was confirmed by the comparison of performance status and BPI. We found higher sum scores of the pain interference items in patients with deteriorated ECOG performance status, whereas mean sum scores of the pain intensity items were not changed (Table 6).

Discussion

Clinical research in pain management depends more and more on multicenter and multinational trials. Thus, assessment tools with a wide distribution and with validated translations in the languages of the participating countries are needed. Even if studies are not designed for the inclusion of a multitude of centers, instruments with international recognition should be preferred, so that comparison with other trials is facilitated.

Compared to other instruments, the BPI offers many advantages. It is short and simple, has been validated in several languages, and contains few descriptive words, so translation is facilitated. The McGill Pain Questionnaire (MPQ)[10] has been translated in more languages than the BPI, but translation of the descriptive words of the MPQ is not without pitfalls. For the German language, three different translations have been validated, sometimes even adding or omitting to the original descriptor lists.[11–13] The BPI does not need complicated procedures for evaluation. Single items such as worst pain intensity provide valuable information that is easily accessible for the treating physician.[14] A validated German version of the BPI was not available until now.

The data from our validation fit in with those of other countries. Using factor analysis, two factors emerged. Pain intensity ratings loaded high on a common factor (pain severity), while the seven interference items showed high loading on another factor (interference with function) (Table 2). This solution with two factors has been shown to be optimal in other languages,[3] and was confirmed in our version by the Comparative Fit Index. Correlation coefficients of the factors did not differ from those of other countries.[4,5] The contribution of the single items is demonstrated by the high correlation alphas if items are deleted (Table 3).

Reliability of a test instrument depends not only on correlation coefficients, but also on test–retest stability. In our study, patients completed the BPI before and after consultation in our outpatient clinic, with at least 30 minutes between test and retest. Correlation coefficients for pain intensity and interference did not change. We choose such a short interval to exclude confounding influences from analgesic management. Other authors have used the BPI for cancer patients at admission and a few days later, with high consistency for the pain items. Pain right now was correlated less

closely, as was to be expected with the normal temporal variations in pain intensity. In a long-term follow-up with reassessment after a mean of 91 days, correlations were lower.[15]

Test–retest stability was not confirmed for the interference items in another study with cancer patients. These patients completed the BPI once weekly during 4 weeks of treatment.[16] After 4 weeks, considerably lower correlations between pain intensities and interference items were described. The authors concluded that interference factors may have a limited utility as a measure of satisfactory pain management. Although these discrepancies should be investigated in further studies, it may be assumed that the BPI shows sufficient reliability and validity for clinical practice.

Of interest not only for evaluation of reliability, but also of the patients' burden, is the number of missing values. Considering all patients approached with the questionnaire, only very few did not answer the questions on pain intensity and on interference with function, while some interference items seemed to be slightly more difficult. Still, nearly 80% of the patients completed the BPI without a missing value, though some reported problems with the questionnaire, and others needed help to complete it. Cancer patients seemed to have as little problems with the BPI as patients with non-cancer-related pain syndromes, and the number of missing values was not higher for cancer patients. The median time for completion of the BPI was 5 minutes.

We conclude that the BPI places only a small burden on the patient, and even less on the administrator. High acceptability was found by other authors too. Approaching 1427 outpatients with recurrent or metastatic cancer, only 51 (3.6%) were not able to complete the BPI because they were either too ill (2.4%) or unable to comprehend or complete the forms (1.2%).[17] Although similar acceptability was found in studies with cancer patients, patients with osteoarthritis, and patients with AIDS,[15,18] this was not confirmed by other authors. In a study with cancer patients, 19% of the patients missed at least one pain intensity item, and 34% at least one interference item,[16] and in a French survey, not even one of the patients with AIDS answered all questions.[19] In a palliative care setting, with more patients with cognitive impairment, the number of missing values may be much higher, and the value of the BPI for patients with slight or moderate cognitive impairment still has to be determined.

As content validity was predefined by the original version of the BPI, we looked more closely at other aspects of validity. Construct validity was confirmed with the factor analysis, as discussed above. Comparison with the domains of the SF-36 quality-of-life questionnaire gave information on convergent validity. The pain intensity factor of the BPI correlated well with the bodily pain factor of the SF-36, but not with other factors or with the main domains, physical and mental health. On the other hand, the pain interference factor correlated with bodily pain, but also with other factors of the SF-36, as well as with physical and mental health. Other authors have used the SF-36[18] or the Functional Living Index–Cancer (FLIC)[20] together with the BPI, but little information on correlations has been given. Physical functioning correlated with the area under the curve of repeated pain intensity assessments with the BPI in patients with herpes zoster.[18] Pain intensity on average correlated with the physical symptom distress subscale of the Memorial Symptom Assessment Scale (MSAS) in a survey of patients with AIDS.[21]

Criterion validity was evaluated by comparison with the performance score. Patients with deteriorated ECOG scores scored higher on the interference items, but not on pain intensity items. More interference with function in patients with deteriorated ECOG scores but without a corresponding increase in pain intensity raises some doubt as to whether the interference-with-function items measure pain-related interference only, or are influenced by other factors too. The correlation of higher scores of the interference items in patients with deteriorated ECOG performance status has not been confirmed by other authors.[22] Breitbart and colleagues described a correlation of pain interference in the BPI with the Karnofsky performance status.[21]

We did not use the BPI for longitudinal evaluation in our study, and therefore cannot offer conclusions about the sensitivity of the BPI to changes of the analgesic therapy or to long-term stability of the instrument. We also did not use the Pain Management Index (PMI) in our study. This index is derived from pain severity and analgesic medication and has been

proposed as a measure for the adequacy of the analgesic therapy.[17,23] The PMI can be used to measure the health care providers' response to the patients' pain. It has been criticized recently,[24] as it is not suited to evaluate the adequacy of the analgesic therapy of individual patients. The PMI considers only the type of analgesic, but not dosage or application. For specific pain syndromes, such as neuropathic pain, the appropriate treatment may not include opioids, resulting in negative PMI scores. Improvement of the PMI score may be the consequence of an improvement of the patients' compliance, prescription of more potent analgesics, or of confounding factors such as concomitant radiotherapy. As the use of the PMI has been described extensively for developed countries and in pain management units,[21,25–28] we did not calculate the PMI for our patients.

In summary, validity and reliability of the German version of the BPI was comparable to the original version. Short-term test–retest stability was high. Patients found the BPI easy to complete and took only a short time for completion. Using the BPI for palliative care patients may be advantageous because it places only a small burden on the patient and offers simple criteria for evaluation. The BPI correlated with quality of life and performance status in this study. Further research is needed to differentiate the impact of pain-related and disease-related interference with function on the items of the BPI, and to evaluate the usefulness of the BPI for longitudinal evaluation and for patients with cognitive impairment. For clinical practice, an algorithm for the evaluation of questionnaires with missing values for single items would be useful.

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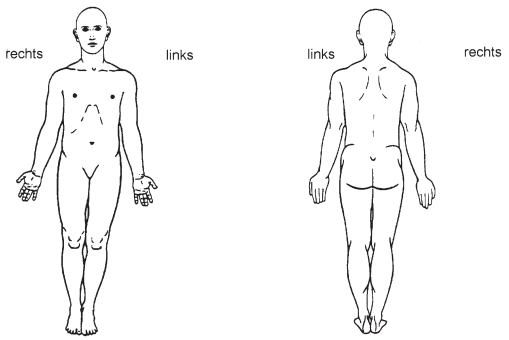
1 Die meisten von uns haben von Zeit zu Zeit Schmerzen (z.B. Kopfschmerzen, Zahnschmerzen, bei Verstauchungen). Hatten Sie **heute andere als diese Alltagsschmerzen?**

☐ ja ☐ nein

2 Schraffieren Sie in nachstehender Zeichnung die Gebiete, in denen Sie Schmerzen haben. Markieren Sie mit "X" die Stelle, die Sie am meisten schmerzt.



3 Kreisen Sie die Zahl ein, die Ihre **stärksten** Schmerzen in den letzten 24 Stunden beschreibt:

0 kein Schmerz **1 2 3 4 5 6 7 8 9 10** stärkste vorstellbare Schmerzen

4 Kreisen Sie die Zahl ein, die Ihre **geringsten** Schmerzen in den letzten 24 Stunden beschreibt:

0 kein Schmerz **1 2 3 4 5 6 7 8 9 10** stärkste vorstellbare Schmerzen

5 Kreisen Sie die Zahl ein, die Ihre **durchschnittlichen** Schmerzen in den letzten 24 Stunden beschreibt:

0 kein Schmerz **1 2 3 4 5 6 7 8 9 10** stärkste vorstellbare Schmerzen

6 Kreisen Sie die Zahl ein, die aussagt, welche Schmerzen Sie **in diesem Moment** haben:

0 kein Schmerz **1 2 3 4 5 6 7 8 9 10** stärkste vorstellbare Schmerzen

7 Welche Behandlungen oder Medikamente erhalten Sie gegen Ihre Schmerzen?

8 Bitte denken Sie an die vergangenen 24 Stunden. Wieviel Schmerzlinderung haben Sie durch Behandlungen oder Medikamente erfahren? Bitte kreisen Sie die Prozentzahl ein, die am besten die Schmerzlinderung zeigt.

0% keine Linderung **10% 20% 30% 40% 50% 60% 70% 80% 90% 100%** vollständige Linderung

Bitte kreisen Sie die eine Zahl ein, die angibt, wie stark Ihre Schmerzen Sie in den vergangenen 24 Stunden beeinträchtigt haben:

9 **Allgemeine Aktivität**

0 keine Beeinträchtigung **1 2 3 4 5 6 7 8 9 10** vollständige Beeinträchtigung

10 **Stimmung**

0 keine Beeinträchtigung **1 2 3 4 5 6 7 8 9 10** vollständige Beeinträchtigung

11 **Gehvermögen**

0 keine Beeinträchtigung **1 2 3 4 5 6 7 8 9 10** vollständige Beeinträchtigung

12 **Normale Arbeit (sowohl außerhalb des Hauses als auch Hausarbeit)**

0 keine Beeinträchtigung **1 2 3 4 5 6 7 8 9 10** vollständige Beeinträchtigung

13 **Beziehung zu anderen Menschen**

0 keine Beeinträchtigung **1 2 3 4 5 6 7 8 9 10** vollständige Beeinträchtigung

14 **Schlaf**

0 keine Beeinträchtigung **1 2 3 4 5 6 7 8 9 10** vollständige Beeinträchtigung

15 **Lebensfreude**

0 keine Beeinträchtigung **1 2 3 4 5 6 7 8 9 10** vollständige Beeinträchtigung

Vielen Dank für Ihre Mitarbeit!

Appendix 1