

Validity of the Czech, German, Italian, and Spanish Version of the Moorehead-Ardelt II Questionnaire in Patients with Morbid Obesity

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Key Words

Bariatric surgery · Quality of life · Health status indicators · EQ-5D · Validity

Summary

Background: The Moorehead-Ardelt II (MA-II) questionnaire is the most frequently applied instrument to assess quality of life (QoL) in bariatric surgery patients. Our aim was to validate the Czech, German, Italian, and Spanish version of the MA-II. **Methods:** A total of 893 patients were enrolled in a prospective cross-sectional European study. Two thirds of the patients ($n = 591$) were postsurgical cases. In addition to demographic and clinical data, QoL data was collected using the MA-II questionnaire, the EuroQoL-5D (EQ-5D), and the Short Form 36 Health Survey (SF-36). Statistical parameters for contingency (Cronbach's alpha), construct and criterion validity (Pearson's r), and responsiveness (standardised effect sizes) were calculated for each language version. **Results:** In the different languages, Cronbach's alpha ranged from 0.817 to 0.885 for the MA-II. These values were higher than those obtained for the SF-36 (0.418–0.607). The MA-II was well correlated to the EQ-5D ($r = 0.662$) and to 3 of the 8 health domains of the SF-36 (0.615, 0.548, and 0.569 for physical functioning, physical role, and general health, respectively). As expected, there was a negative correlation between the MA-II and the BMI ($r = -0.404$ for all patients), but no significant correlation with age was found. When comparing both the heaviest and the lightest third of the patients, mean responsiveness was higher for the MA-II (-1.138) than for the domains of

the SF-36 (range -0.111 to -1.070) and the EQ-5D (-0.874). **Conclusion:** The Czech, German, Italian, and Spanish version of the MA-II questionnaire are valid instruments and should be preferred to generic questionnaires as they provide better responsiveness.

Introduction

When describing the effects of weight-loss therapy, it is necessary to evaluate changes in quality of life (QoL) as obesity influences nearly every aspect of physical, mental, social, and emotional health [1–3]. In most of the literature on bariatric surgery, the Moorehead-Ardelt II questionnaire (MA-II) is used for analysing health-related quality-of-life before or after surgery [4, 5]. The MA-II consists of only 6 items, making it an easy-to-complete questionnaire. The results can be combined with scores on weight loss and complications into a summary estimate called Bariatric Analysis and Reporting Outcome System (BAROS) [6, 7]. The MA-II is used in nearly all European countries (including the former Soviet Union states), North America, Australia, and some Asian as well as South or Middle American countries. Many bariatric surgeons prefer the MA-II or similar instruments to more general questionnaires because the MA-II is short and was designed especially for bariatric patients. A disease-specific instrument is usually more sensitive to change and thus is more precise [8, 9].

In spite of its widespread use, the MA-II has not yet been validated in any language other than English [5]. Therefore, the aim of this study was to evaluate and compare the psychometric properties of

Table 1. Wording of the MA-II questionnaire in the different languages

Item	English	Czech	German	Italian	Spanish
1	Usually I feel <i>very badly about myself</i> <i>very good about myself</i>	Cítím se většinou <i>velmi špatně</i> <i>velmi dobře</i>	Ich fühle mich zumeist <i>sehr schlecht</i> <i>sehr gut</i>	Di solito mi sento <i>molto male</i> <i>molto bene</i>	La mayoría de las veces me siento <i>muy mal</i> <i>muy bien</i>
2	I enjoy physical activities <i>not at all</i> <i>very much</i>	Mohu tělesně <i>velmi málo podnikat</i> <i>velmi mnoho podnikat</i>	Ich kann körperlich <i>sehr wenig unternehmen</i> <i>sehr viel unternehmen</i>	L'attività fisica mi diverte <i>per niente</i> <i>molto</i>	La actividad física me divierte <i>poco</i> <i>mucho</i>
3	I have satisfactory social contacts <i>none</i> <i>very many</i>	Mé společenské kontakty jsou <i>velmi neuspokojivé</i> <i>velmi uspokojivé</i>	Meine Sozialkontakte sind <i>sehr unbefriedigend</i> <i>sehr befriedigend</i>	Ho contatti sociali soddisfacenti <i>per niente</i> <i>molto</i>	Mis contactos sociales satisfactorios son <i>poco</i> <i>mucho</i>
4	I am able to work <i>not at all</i> <i>very much</i>	Má práce mi dělá <i>velmi málo radosti</i> <i>velmi mnoho radosti</i>	Meine Arbeit macht mir <i>sehr wenig Spaß</i> <i>sehr viel Spaß</i>	Sono in grado di lavorare <i>per niente</i> <i>molto</i>	Yo soy capaz de trabajar <i>no del todo</i> <i>mucho</i>
5	The pleasure I get out of sex is <i>not at all</i> <i>very much</i>	Mé potěšení na sexu je <i>velmi malé</i> <i>velmi velké</i>	Meine Freude am Sex ist <i>sehr gering</i> <i>sehr groß</i>	Un rapporto sessuale mi procura piacere <i>per niente</i> <i>molto</i>	Tengo ganas de actividad sexual <i>poco</i> <i>mucho</i>
6	The way I approach food is: <i>I live to eat</i> <i>I eat to live</i>	Můj vztah k jídlu: <i>Žiji, abych jedl</i> <i>Jím, abych žil</i>	Meine Einstellung zum Essen ist: <i>Ich lebe, um zu essen</i> <i>Ich esse, um zu leben</i>	Il mio atteggiamento nei confronti del cibo è: <i>Vivo per mangiare</i> <i>Mangio per vivere</i>	Mi actitud para la comida es: <i>Vivo para comer</i> <i>Como para vivir</i>

the MA-II in four European languages. In a first analysis, a conversion algorithm between MA-II scores and utility values was established for health economic purposes [10]. In the present article, the overall validity of the MA-II is reported. According to current standards of validation studies [11], we report on contingency, construct and criterion validity, and responsiveness.

Patients and Methods

Study Design

The study was a cross-sectional survey executed in four European countries between August and December 2007. After ethical approval, 5 leading centres of bariatric surgery took part in the study. In order to achieve high generalisability of results, centres performing different types of bariatric procedures worked together. For practical reasons, a sample size of about 800 patients was chosen. All patients were informed about the study by their surgeon and provided written informed consent to participate in the study. To ensure the accuracy of medical data, the centres were monitored on site during the study.

Study Sample

The study sample included pre- and postoperative patients in order to cover all disease states for which the MA-II is used in daily practice. Patients were eligible for the study if they were scheduled for bariatric surgery or had already received any bariatric operation in the past. Therefore, patients with quite diverse degrees of obesity (including return to normal body weight) were included. All patients were morbidly obese either in the present or in the past, however, we excluded patients who had had their index operation within the last 3 months because the immediate consequences of surgery usually have strong effects on QoL, thus leading to unwanted variability in the data. Patients were recruited during their pre- or postoperative visit to the out-patient clinic.

Sociodemographic and clinical data such as sex, age, current weight, height, metabolic, pulmonary, cardiovascular or other comorbidities were extracted from the patients' files. For each comorbidity, severity was classified in moderate (requiring no or only occasional medical therapy) or severe (requiring regular treatment by drugs or devices). For postsurgical patients, data on preoperative weight and comorbidities as well as the date and type of surgery and the occurrence of complications were collected. If a patient underwent more than one operation (e. g. sleeve gastrectomy followed by biliopancreatic diversion with duodenal switch), only the first surgery was counted as index operation.

Questionnaires

The MA-II consists of 6 questions which were scored on a scale from 1 to 10. The topics of these questions are mood, physical function, social relationships, ability to work, sexuality, and eating behaviour. For every topic the ends of the scales are described and underlined by coloured icons. Higher scores represent better health-related QoL. A summary score which ranges from -3 to +3 can be calculated. When computing the MA-II summary score, missing values for item 5 (sexuality) were replaced by the mean of the other 5 items. For the purpose of this study, the English version of the MA-II was translated into Czech, German, Italian, and Spanish. All translations (table 1) were done by native speakers with the authorisation of the copyright owner. Translations were checked for face validity and linguistic accuracy by the surgeons in each country.

For an evaluation of construct validity, all patients also filled in 2 generic questionnaires. The EuroQoL-5D (EQ-5D) is a commonly used instrument which consists of 5 items and a visual analogue scale [12, 13]. It describes the following 5 subjects of health: mobility, self-care, usual activities, pain, and anxiety/depression. We used standard methods as described by Greiner et al. [14] to calculate a summary score. As a third instrument, the Short-Form Health Survey 36 (SF-36, version 2 with 4-week recall) was used. Based on 36 items, the SF-36 evaluates 8 different domains of health-related QoL [15]. From an item subset the SF-6D summary score can be calculated, which gives an estimate of the patient's general health state [16].

Table 2. Contingency of the MA-II, EQ-5D and the SF-36. Values are Cronbach's alpha^a

Number of patients	Subgroup	Czech Republic	Germany	Italy	Spain	All
	all	200	400	149	144	893
	preoperative	106	113	65	18	302
	postoperative	94	287	84	126	591
<i>Questionnaire</i>						
MA-II scale	all	<i>0.821</i>	<i>0.885</i>	<i>0.817</i>	<i>0.868</i>	<i>0.855</i>
	preoperative	<i>0.859</i>	<i>0.838</i>	<i>0.789</i>	<i>0.917</i>	<i>0.841</i>
	postoperative	<i>0.678</i>	<i>0.858</i>	<i>0.746</i>	<i>0.832</i>	<i>0.818</i>
EQ-5D	all	<i>0.759</i>	<i>0.765</i>	<i>0.822</i>	<i>0.811</i>	<i>0.781</i>
	preoperative	<i>0.789</i>	<i>0.734</i>	<i>0.829</i>	<i>0.827</i>	<i>0.796</i>
	postoperative	<i>0.669</i>	<i>0.728</i>	<i>0.643</i>	<i>0.753</i>	<i>0.716</i>
SF-36	all	0.589	0.457	0.418	0.607	0.549
	preoperative	0.583	0.387	0.589	0.556	0.553
	postoperative	0.569	0.487	0.106	0.566	0.538

^a Values > 0.7 are given in italics.

Statistical Validation

Firstly, contingency (or internal consistency) of the MA-II scale was assessed. Contingency describes how well the different items of a questionnaire describe the same psychometric construct [11]. For this purpose, Cronbach's alpha was calculated for the MA-II scale in each language. For comparison, contingency was also measured for the EQ-5D and the SF-36. In addition, contingency analyses were repeated for predefined patient subgroups. In the subgroup analyses, we focused on patients with a BMI < 30 and those with a BMI > 40. In comparison, we defined all pre- and all postoperative patients as subgroups. Comparisons between the different countries are only descriptive.

Secondly, we studied construct validity, which describes the extent to which a measure is related to other similar instruments [17]. This study used Pearson's coefficient *r* to quantify the correlation between the MA-II scale, the EQ-5D, and the 8 health domains of the SF-36. Pearson's *r* ranges between -1 and 1, and a coefficient > 0.6 or 0.8 indicates high or very high correlation [11]. In this analysis, the summary scores of the MA-II and the EQ-5D were used. Again, analyses were repeated for the predefined subgroups.

Next, criterion validity was evaluated. Criterion validity addresses the issue of whether an instrument is correlated to a relevant external outcome variable [17], such as the degree of obesity. We examined how well the MA-II-scale was correlated (Pearson's *r*) to BMI and age. As before, analyses were done on a country-specific level and then repeated in specific subgroups.

Finally, sensitivity to change (or responsiveness) was studied. Instruments with a high responsiveness are able to detect even small changes over time or small differences between 2 groups [18]. The sample was subdivided into 3 groups (i. e. terciles) according to BMI. The heaviest third of the patients (*n* = 300) consisted mainly of preoperative patients (65%), whereas in the lightest tercile (*n* = 296) nearly all patients (98%) were postsurgical cases. The difference in MA-II score between the heaviest and the lightest tercile was calculated and divided by the standard deviation of the lightest tercile. If this standardised effect size reaches values > 0.8 (regardless of plus or minus sign), this indicates good sensitivity to change [18]. In addition, standardised effect sizes were calculated from the difference between post- and preoperative patients divided by the standard deviation of the preoperative patients.

Results

Patients

The sample consisted of 591 postoperative and 302 preoperative patients. The number of patients per country can be found in table 2. The ratio of pre- and postsurgical patients varied between

the different countries. Also, the surgical procedures varied: gastric bypass (48.2%), gastric banding (29.8%), one-anastomosis gastric bypass (9.6%), sleeve gastrectomy (5.2%), and biliopancreatic diversion (4.2%). The majority of patients were female (78.6%). The patients' current BMI ranged from 17 to 75 kg/m², with a large difference between pre- and postoperative cases (mean BMI 46.0 vs. 34.9). The overall prevalence of comorbidities such as cardiovascular diseases (33%), diabetes mellitus (11%), other metabolic diseases (20%), pulmonary diseases (13%), and knee arthritis (25%) was high.

Contingency

Cronbach's alpha ranged from 0.817 to 0.885 for the MA-II scale (table 2), which was higher than that for the SF-36 (range: 0.418–0.607). There were no relevant differences between the four languages, however, postoperative results appeared to be more heterogeneous as evidenced by consistently lower alpha values in all 3 instruments. Overall contingency of the EQ-5D was 0.781, which was higher than that of the SF-36 but lower than that of the MA-II.

Construct Validity

As shown in table 3, the MA-II scale correlated well with the SF-6D (*r* = 0.734) and the EQ-5D (*r* = 0.662). The correlation between the MA-II and the SF-6D was stronger than the correlation between the MA-II and the EQ-5D. The strength of both associations varied slightly among the different languages but was largely unaffected by the status of the patient (pre- vs. postsurgical cases). For example, the correlation between the MA-II and the EQ-5D reached 0.636 in preoperative and 0.617 in postoperative patients. For the correlation between the MA-II and the SF-6D the respective values were 0.698 and 0.696.

As expected, the correlations between the MA-II summary score and the different domains of the SF-36 were incoherent with regard to the clearly lower correlations seen in the mental health and vitality domain. The strongest correlation was found for physical functioning (*r* = 0.615). With a few exceptions, all correlations were significant.

Table 3. Construct validity for the MA-II scale in comparison to other QoL instruments^a

	Czech Republic	Germany	Italy	Spain	All
EQ-5D	0.582**	0.673**	0.688**	<i>0.770**</i>	0.662**
SF-6D	0.698**	<i>0.769**</i>	0.692**	<i>0.720**</i>	<i>0.734**</i>
SF-36 physical functioning	0.617**	<i>0.744**</i>	0.589**	0.341**	0.615**
SF-36 role-physical	0.592**	0.625**	0.572**	0.263**	0.548**
SF-36 bodily pain	0.278**	0.470**	0.541**	0.170*	0.395**
SF-36 general health	0.472**	0.616**	<i>0.726**</i>	0.467**	0.569**
SF-36 vitality	0.341**	0.269**	0.145	0.368**	0.280**
SF-36 social functioning	0.055	0.472**	0.666**	0.089	0.360**
SF-36 role-emotional	0.374**	0.473**	0.392**	0.124	0.365**
SF-36 mental health	0.272**	0.154**	0.123	0.252**	0.180**

^a Values are Pearson's correlation coefficients. Values > 0.7 are given in italics.

**p < 0.01.

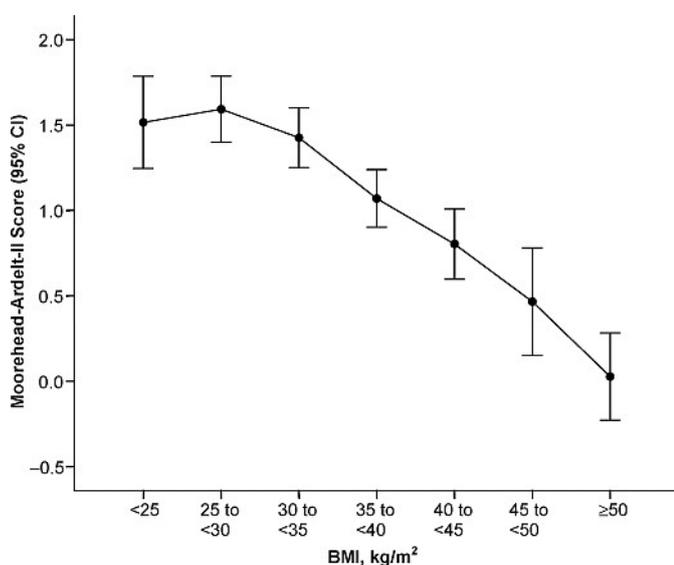


Fig. 1. Relationship between BMI and MA-II scale. Whiskers indicate 95% CI.

Criterion Validity

In the full patient sample, the MA-II scale correlated negatively with the BMI ($r = -0.404$; $p < 0.01$). As depicted in figure 1, the association between the BMI and the MA-II scale value is nearly linear, although a ceiling effect can be observed when the BMI is < 30. Both generic questionnaires showed similar correlations with the BMI (-0.333 for EQ-5D, -0.356 for SF-6D) but both correlations were weaker than that of the MA-II (table 4). We checked for between-country variability but found no evidence of any heterogeneity. Age had only a modest influence on QoL, i. e. correlation coefficients were < 0.1 for all instruments.

Sensitivity to Change

For the MA-II, the mean standardised effect size was -1.138 (range -1.004 to -1.466). As shown in table 5, the responsiveness of the EQ-5D (-0.874) and of the SF-6D (-0.870) were markedly lower. Apart from the MA-II scale, only the physical functioning domain of the SF-36 reached a standardised effect size > 1. The lowest effect size was found for the mental health domain. Similar results

were obtained when the calculation of sensitivity to change was based on the comparison between pre- and postsurgical cases.

Discussion

This study shows that the MA-II is a valid instrument for assessing QoL in morbidly obese patients before or after bariatric surgery. As the results were similarly good in the different languages, all 4 versions of the MA-II can be recommended for clinical use. Moreover, our results on contingency (Cronbach's alpha: 0.82–0.89) replicate those of the original validation study in which a value of 0.84 was found [5]. In addition to the psychometric properties of the MA-II, we noted that the burden of filling in the questionnaire is small, thus rendering this instrument suitable for everyday clinical use. A minor problem of the MA-II is the item on sexuality which about 5% of the patients are unwilling or reluctant to answer. However, this problem can easily be dealt with by using simple rules for replacing missing items.

The results on sensitivity to change show better values for the MA-II than for the EQ-5D, the SF-6D, and the SF-36. Given the fact that the MA-II is a disease-specific questionnaire, this finding had to be anticipated [8]. On closer inspection, however, some items of the MA-II are addressing general QoL without specific reference to obesity. Nevertheless, an item-specific analysis of sensitivity to change showed that these more general items fully contribute to the good overall sensitivity to change of the MA-II. From the data on sensitivity to change it becomes clear that the largest improvements of bariatric surgery affect QoL by improving physical functioning and general health. Therefore, it is likely that the generic questionnaires had a lower sensitivity to change because these instruments also included the mental or other related domains which are affected by bariatric surgery or weight loss to a much lesser degree than the physical domain [19].

When comparing the MA-II to other obesity-specific instruments, some differences but also similarities emerge. The Impact of Weight on Quality of Life (IWQOL) questionnaire, available with 74 or 31 items, was extensively validated and showed high internal consistency [2, 20, 21], though it appears too long for routine clinical

Table 4. Criterion validity of the MA-II scale and other QoL instruments regarding BMI and age^a

Correlated parameters	Czech Republic	Germany	Italy	Spain	All
BMI					
MA-II scale	-0.329**	-0.489**	-0.393**	-0.266**	-0.404**
EQ-5D	-0.275**	-0.324**	-0.391**	-0.394**	-0.333**
SF-6D	-0.342**	-0.389**	-0.327**	-0.259**	-0.356**
Age					
MA-II scale	-0.155**	-0.006	-0.234**	0.095	-0.065
EQ-5D	-0.211**	-0.092	-0.253**	0.059	-0.090**
SF-6D	-0.140	0	-0.185*	0.097	-0.054

^a Values are Pearson's correlation coefficients.

** p < 0.01.

Table 5. Responsiveness of the MA-II scale and other QoL instruments^a

	Czech Republic	Germany	Italy	Spain	All
MA-II scale	<i>-1.466</i>	<i>-1.244</i>	<i>-1.343</i>	<i>-1.004</i>	<i>-1.138</i>
EQ-5D	<i>-1.342</i>	<i>-0.532</i>	<i>-1.414</i>	<i>-1.760</i>	<i>-0.874</i>
SF-6D	<i>-1.182</i>	<i>-0.878</i>	<i>-0.870</i>	<i>-0.760</i>	<i>-0.870</i>
SF-36 physical functioning	<i>-1.198</i>	<i>-1.691</i>	<i>-1.535</i>	<i>-0.646</i>	<i>-1.070</i>
SF-36 role-physical	<i>-1.087</i>	<i>-0.747</i>	<i>-0.970</i>	<i>-0.609</i>	<i>-0.666</i>
SF-36 bodily pain	<i>-0.326</i>	<i>-0.717</i>	<i>-0.637</i>	<i>0.252</i>	<i>-0.424</i>
SF-36 general health	<i>-0.584</i>	<i>-0.544</i>	<i>-1.299</i>	<i>-0.905</i>	<i>-0.602</i>
SF-36 vitality	<i>-0.382</i>	<i>-0.197</i>	<i>-0.273</i>	<i>-0.323</i>	<i>-0.274</i>
SF-36 social functioning	<i>0.001</i>	<i>-0.449</i>	<i>-0.902</i>	<i>-0.346</i>	<i>-0.238</i>
SF-36 role-emotional	<i>-0.557</i>	<i>-0.351</i>	<i>-0.506</i>	<i>-0.272</i>	<i>-0.292</i>
SF-36 mental health	<i>-0.482</i>	<i>-0.200</i>	<i>0.181</i>	<i>-0.384</i>	<i>-0.111</i>

^a Values represent differences between heaviest and lightest third of all patients divided by the standard deviation of the lightest third. Values > 1.0 are given in italics.

cal use [22]. The Bariatric Quality of Life (BQL) index [9], a 14-item questionnaire available in English and German so far, exhibited good psychometric properties (e. g. Cronbach's alpha between 0.80 and 0.93) and outperformed generic questionnaires with regard to sensitivity to change. There are some more disease-specific questionnaires but these are either only rarely used or have not yet been validated for the morbidly obese population [22]. Finally, many bariatric surgeons have used the Gastrointestinal Quality of Life Index (GIQLI) but this instrument was developed for intestinal diseases [23]; hence, the GIQLI is able to assess the impact of bariatric surgery side effects on QoL but does not cover the physical and psychological benefits of weight loss.

Possible shortcomings of the present study include the following: Firstly, the study did not assess reliability. Data collection was neither repeated at an interval nor compared between different settings; hence, intrarater reliability and possible biases of in-hospital data collection cannot be fully ruled out. Secondly, it was not possible to examine the psychometric structure of the MA-II scale in detail (e. g. by factor analysis), but this was simply due to the fact that the MA-II contains too few items for such analyses.

The correlation between the MA-II and the BMI ($r = -0.404$) was moderate but this was also the case in previous studies [8, 21]. It can be assumed that correlation coefficients rise in parallel to the average BMI of the study population because more extreme degrees of obesity have a stronger influence on health and QoL [24–

26]. Therefore, it is difficult to compare correlation coefficients across studies. Apparently, no floor or ceiling effects are present when using the MA-II in patients with extreme or nearly normal BMI. The linearity of the association lends support to the idea that similar differences on the MA-II scale represent similar clinical improvements (i. e. equidistance), thereby facilitating the interpretability of the MA-II and BAROS results.

For dedicated scientific purposes, it may be necessary to administer more specific questionnaires in addition to the MA-II. This may be the case if a detailed assessment of comorbidities, psychological aspects, or eating behaviour is planned [27, 28]. For a routine assessment of local results or a multicentric quality control study, however, the MA-II (or the BAROS) appears to be advantageous, mainly due to its shortness. From the present study, it can be concluded that the MA-II also is psychometrically sound and provides superior sensitivity to change. Therefore, the Czech, German, Italian, and Spanish version of the MA-II questionnaire can be fully recommended for clinical use.

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Disclosure

The authors declared no conflict of interest.

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