

# Validation of the Greek Translation of the Obesity-Specific Moorehead–Ardelt Quality-of-Life Questionnaire II

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**Abstract** Morbid obesity adversely affects quality of life. The assessment of health-related quality of life (HRQoL) needs specific measuring instruments. The Moorehead–Ardelt Quality-of-Life Questionnaire II (MA II) is an obesity-specific instrument widely used in bariatric surgery. The objective of this study was to translate and validate the MA II in Greek language. The study included the translation of the MA II followed by cross-validation with the Greek version of 36-item Short Form Health Survey (SF-36) and a Visual Analogue Scale (VAS) in subjects visiting an obesity clinic. Internal consistency was indicated by Cronbach's alpha coefficient and test–retest reliability by intraclass correlation coefficient (ICC). Construct validity was studied using Pearson's correlations between the MA II, the SF-36 and the VAS. A total of 175 patients were enrolled in the study. Test–retest analysis was applied to 40 patients with a 15-day interval. A very good internal consistency with Cronbach's alpha coefficient of 0.85 was shown. Excellent test–retest reliability was observed with an overall ICC of 0.981. Significant correlations between the Greek MA II and the other instruments as well as of each item of the MA II with the scores of SF-36 and the VAS indicated high construct and convergent validity. A negative correlation between the translated MA II total score and BMI confirmed high clinical validity. The Greek version of the MA II

questionnaire has been generated and shown to be valid and reliable in measuring HRQoL in morbidly obese patients before and after bariatric surgery.

**Keywords** Bariatric surgery · Health-related quality of life · Moorehead–Ardelt II questionnaire · Translation · Validation

## Introduction

As standards of living continue to rise, the global epidemic of obesity is rapidly becoming a major public health problem in many parts of the world [1]. Surgery is considered the only effective treatment for morbid obesity with long-term sustained weight loss and postoperative complete resolution or significant improvement in obesity-related co-morbidities [2, 3]. Several studies have demonstrated the safety and efficacy of bariatric surgery [2–4]. However, bariatric surgery should be carried out in specialized medical institutions, properly equipped to care for the obese patient in a multidisciplinary setting [5].

Morbid obesity adversely affects quality of life and physical performance even in young adults [6, 7]. The assessment of health-related quality of life (HRQoL) has gained significant attention with rigorous standards formed regarding the development and psychometric validation of HRQoL measuring instruments [8, 9]. These instruments go beyond conventional indices such as BMI. Although BMI represents an important medical indicator of health, it does not adequately demonstrate the patient's functional impairment in his or her daily life.

In the context of a study designed to quantitatively assess the impact of bariatric surgery on HRQoL in Greek morbidly obese patients, we used the obesity specific Moorehead–Ardelt Quality-of-Life Questionnaire II (MA II). MA II is a

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validated, disease specific instrument that measures quality of life in the morbidly obese population before and after surgery and is part of the Bariatric Analysis and Reporting Outcome System (BAROS), one of the standard outcome evaluations for bariatric surgery [10–12]. The MA II is a copyright protected instrument that can be also used independent of BAROS for clinical follow-up after either medical or surgical interventions and is widely used in many European countries, North America, Australia and some Asian countries [13, 14].

The majority of HRQoL instruments have been created and validated in Anglo-Saxon countries and the necessity to test their validity in different patient groups is frequently underscored. According to current standards of validation studies, adapting questionnaires from one language to another should employ standardized methodology to ensure that the instrument retains its psychometric properties [15]. The validity and reliability of an instrument may vary as a result of translation not only because of the linguistics but also because of the specific social and cultural features of the country. Therefore, an assessment of the properties of the Hellenic version of MA II before its routine use in bariatric patients was deemed as necessary. The aim of the present study was to describe the development and validation of the MA II obesity-specific HRQoL questionnaire in Greek language. The primary objective was to assess its reliability and validity in conjunction with the generic 36-item Short Form Health Survey (SF-36) that has already been validated in Greek patients [16].

## Patients and Methods

### Study Sample

The present study includes the translation of the MA II into the Greek language followed by cross-validation with the Greek version of SF-36 and a Visual Analogue Scale (VAS) in subjects visiting an obesity clinic, at the University Hospital of Heraklion. The study was approved by the local ethics committee and written consent was obtained from each participant. The study sample included both pre- and postoperative patients in order to cover all disease states for which the MA II can be 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; excluding those who had had their operation within the last 3 months as the immediate consequences of surgery usually have strong effects on quality of life. Therefore, patients with different degrees of obesity were included. This certainly does not exclude the administration of the MA II clinically during this specific period of time. Patients were recruited during their pre- or postoperative visits to the outpatient clinic during a 6-month period.

### Questionnaires

We obtained the permission of Dr. M. Moorehead to translate and validate the MA II into a Greek language version. The first step involved translation of the MA II into Greek by a panel of physicians including bariatric surgeons and internists. Then, an official bilingual translator did a back-translation into English. Secondly, the back-translation was compared with the original and the panel looked upon the differences between the two versions. The final Greek version was created after thorough discussions with the panel experts. Any discrepancies were resolved by consensus. The Greek version of the MA II has the same structure as the original questionnaire [12]. It consists of six questions which are scored on a 10-point scale from -0.5 to 0.5. The topics of these questions are self-esteem (Q1), physical activity (Q2), social contacts (Q3), ability to work (Q4), sexuality (Q5) and eating behaviour (Q6). For each item of the questionnaire, there are coloured illustrations at the extremities of the answering scale, specifically designed to motivate and facilitate the completion of the test, regardless of the educational level or cultural background of the patient. The total score for MA II was obtained by the sum of scores from each question.

For validation purposes, HRQoL was assessed by a Greek version of the non-disease-specific tool SF-36 (with a 4-week recall) and a VAS. The SF-36 is a widely used generic instrument, which has been validated in many different disease states and conditions both in general population as well as in cohorts of obese patients [6, 7, 17]. The SF-36 evaluates eight different domains of HRQoL. It has 36 questions grouped into eight fields: physical functioning (ten items), physical role (four items), bodily pain (two items), general health (six items), vitality (four items), social functioning (two items), emotional role (three items), and mental health (five items). The scores for the SF-36 questions range from 0 to 100, with a higher score indicating a better health status [18]. The SF-36 domains can also be summarised into two major subcategories: physical component summary and mental component summary, which represent the physical functioning and well-being and emotional well-being, respectively [19]. The VAS was used as an alternative assessment instrument of the state of general well-being experienced by the patients themselves. It consisted of a horizontal Likert scale from 1 to 7; 1 represented the worst health status and 7 represented the best health status, with a cross-line indicating the middle. VAS have been used widely in clinical and research settings, especially in quantifying subjective parameters such as pain and mood. They are considered to be convenient, easy and rapidly administered measurement instruments. VAS is a single-item measure, that is, an instrument measuring the whole construct at once, thus it is easy to use and therefore applicable to a variety of practice and research settings

[20–22]. The order of completion of the questionnaires was counterbalanced.

### Statistical Analysis

Descriptive statistics of the patients' characteristics are presented as mean±standard deviation. Quantitative variables are presented as absolute and relative frequencies. Internal consistency was indicated by Cronbach's alpha coefficient, which was considered adequate if higher than 0.70. The test–retest reliability (2 weeks apart) was determined by single measure intraclass correlation coefficient (ICC). The size of the test–retest sample was based, as suggested by Walter et al., on calculations showing that the sample size provides sufficient power to detect an ICC of 0.85 with a minimum ICC of 0.75 [23]. The 15-day interval was chosen to measure test–retest reliability, as enough time had elapsed to prevent patients from remembering their responses to the first administration of the questionnaire, but not enough time to allow clinically meaningful change to occur. An ICC value of >0.70 was considered acceptable. Construct validity was studied using Pearson's test to quantify the correlation between the MA II scores, the SF-36 questions scores and the VAS score. The percentage of subjects scoring at the lowest possible level of the scale (floor effect) and the highest possible level (ceiling effect) were also examined. Floor and ceiling effects should be minimal, and we used 15% as the critical value for those effects. Multiple stepwise linear regression analysis was also performed to identify independent predictors for the MA II total score. A *P* value (two-tailed) of <0.05 was considered statistically significant. All statistical analyses were performed using the SPSS 17.0 (SPSS Inc, Chicago, IL, USA).

### Results

A total of 175 consecutive patients were enrolled in the study. Mean age of the study cohort was 38.8±11.0 years. The sample consisted of 56 preoperative and 119 postoperative

patients. Patient clinical characteristics and mean scores of HRQoL instruments are summarized in Table 1.

### Reliability

The Greek version of the MA II questionnaire showed very good overall internal consistency with Cronbach's alpha coefficient of 0.85. Calculation of the Cronbach's alpha coefficient in the subgroups of pre- and postoperative patients showed also very good internal consistency with a coefficient of 0.81 and 0.79, respectively. Test–retest analysis was applied to 40 obese patients. An excellent agreement on test–retest reliability was observed with an overall ICC of 0.981 (95% confidence interval (95% CI), 0.964–0.990). The ICC values for each of the MA II questions were as follows: self-esteem, 0.975 (95% CI, 0.954–0.987); physical activity, 0.974 (95% CI, 0.951–0.986); social contacts, 0.964 (95% CI, 0.932–0.981); ability to work, 0.962 (95% CI, 0.929–0.980); sexuality, 0.982 (95% CI, 0.967–0.991); and eating behaviour, 0.889 (95% CI, 0.801–0.940).

### Validity

To assess the structural validity of the MA II, we examined the correlations between the questions, expecting that since they all measure aspects of the same construct (obesity), they should correlate significantly with each other. Indeed, results yielded significant correlations in accordance with those already reported [13, 14] (Table 2). The strongest interscale correlations were found between the self-esteem and sexuality and eating behaviour scales ( $r=0.628$ ).

Significant correlations between the Greek version of MA II and the other instruments indicated high construct validity for the translated version of MA II (Table 3). Correlations among the total scores of MA II, SF-36 fields and VAS were similar in pre- and postoperative subgroups (Table 3). Moreover, we observed that each individual item on the Greek version of MA II showed strong correlation with the domain and summary scores of SF-36 as well as with the VAS, indicating an adequate convergent validity (Table 4). The

**Table 1** Study population characteristics

	Preoperative patients	Postoperative patients	Total	
Number	56 (32%)	119 (68%)	175	
Gender (male/female)	30/26 (53.6%/46.4%)	31/88 (26%/74%)	61/114 (34.9%/65.1%)	
MA II Moorehead–Ardelt				
Quality-of-Life Questionnaire II,	Age (years)	36.0±10.9	40.1±10.8	38.8±11.0
SF-36 Greek version of 36-item	BMI (kg/m <sup>2</sup> )	46.8±8.7	35.6±6.5	39.3±8.9
Short Form Health Survey,	MA II total score	-0.03±1.2	1.5±1.02	1.01±1.3
PCS physical component	SF-36 PCS	42.1±9.3	51.9±7.7	48.7±9.4
summary, MCS mental	SF-36 MCS	43.5±13.8	48.8±12.2	47.0±12.9
component summary, VAS	VAS	4.9±1.3	5.2±1.1	5.1±1.2
Visual Analogue Scale				

**Table 2** Correlation matrix of the MA II questionnaire items

	Q2	Q3	Q4	Q5	Q6
Q1	0.612	0.589	0.524	0.628	0.628
Q2		0.438	0.499	0.474	0.391
Q3			0.562	0.568	0.349
Q4				0.606	0.312
Q5					0.339

Pearson’s *r* correlation coefficients are shown. All *P* values are <0.001  
 MA II Moorehead–Ardelt Quality-of-Life Questionnaire II

percentage of patients scoring at the lowest possible level of the scale and at the highest possible level was 1.1% (representing two preoperative patients) and 4.6% (representing eight postoperative patients), respectively. Nonetheless, the critical value of 15% was not surpassed, and thus, it can be conclusively stated that there was neither a ceiling nor floor effect.

Clinical validity was also assessed by evaluating correlations between the instrument and the obesity-related characteristics of our cohort. A statistically significant negative correlation was found between the translated MA II total score and BMI ( $r=-0.50, P<0.001$ ), indicating that patients with a higher BMI scored lower on quality of life (Fig. 1). Furthermore, multivariate regression analysis of MA II total score using age, gender, BMI and time-point (pre- vs. post-operative) as independent predictors confirmed the inverse association between BMI and the MA II measures (Table 5).

**Discussion**

HRQoL questions about perceived physical and mental health and function have become an important component of health surveillance and are generally considered valid

indicators of service needs and intervention outcomes. Thus, HRQoL evaluation has become an important outcome measure following bariatric surgery [24, 25]. This is highlighted by the significant impact of morbid obesity and its surgical treatment on functional, emotional, social and professional aspects of affected individuals [26, 27]. A large number of deaths due to suicide and drug overdose have been reported after bariatric surgery. Most of them occurred at least 1 year after surgery, suggesting that careful follow-up, especially the need to recognize and treat depression, should be provided for patients who have undergone bariatric surgery [28, 29]. It is well established that there is an inverse correlation of depression and suicide ideation and quality of life, especially when patients score to the extreme left on all areas of the MA II [12].

Typically, HRQoL is measured by the application of specific questionnaires, like MA II for morbid obesity which was designed and developed in an English-speaking country. For their use in other countries and cultures, these questionnaires require rigorous translation and validation. We have successfully translated and validated this questionnaire for the Greek population.

A valid translation is indispensable to obtain a HRQoL questionnaire that performs well in a culture different for which the instrument was originally designed. Content validity was established by the meticulous translation and back translation of the original version into the Greek language. This disease-specific questionnaire was validated in Greek language in order to assist physicians in monitoring the outcome of bariatric interventions in morbidly obese patients. The translation of the MA II will contribute to the evolution of a bariatric surgery-associated health status instrument across different nations and cultures. Ultimately, this should enhance the feasibility of multicenter and multinational studies that assess the obesity impact and the

**Table 3** Concordance of the MA II questionnaire with VAS and SF-36 fields

	MA II (preoperative patients)	MA II (postoperative patients)	MA II (total patients)
VAS	0.656	0.630	0.754
SF-36 fields			
Physical functioning	0.669	0.704	0.781
Physical role	0.570	0.473	0.544
Emotional role	0.380	0.618	0.479
Vitality	0.627	0.700	0.707
Mental health	0.578	0.620	0.645
Social functioning	0.492	0.562	0.606
Bodily pain	0.488	0.480	0.511
General health	0.702	0.702	0.804
PCS	0.651	0.496	0.676
MCS	0.465	0.623	0.562

Pearson’s *r* correlation coefficients are shown. All *P* values are <0.001

MA II Moorehead–Ardelt Quality-of-Life Questionnaire II, SF-36 Greek version of 36-item Short Form Health Survey, VAS Visual Analogue Scale, PCS physical component summary, MCS mental component summary

**Table 4** Correlations between MA II questions, SF-36 fields and VAS

	Q1 Self-esteem	Q2 Physical activity	Q3 Social contacts	Q4 Ability to work	Q5 Sexuality	Q6 Eating behaviour
SF-36 fields						
Physical functioning	0.625*	0.708*	0.385*	0.695*	0.609*	0.508*
Physical role	0.365*	0.390*	0.480*	0.510*	0.521*	0.232**
Emotional role	0.355*	0.406*	0.429*	0.364*	0.528*	0.092
Vitality	0.625*	0.555*	0.488*	0.592*	0.575*	0.394*
Mental health	0.646*	0.442*	0.408*	0.514*	0.532*	0.410*
Social functioning	0.585*	0.420*	0.468*	0.525*	0.497*	0.288*
Bodily pain	0.357*	0.417*	0.349*	0.569*	0.483*	0.145
General health	0.724*	0.701*	0.492*	0.566*	0.613*	0.558*
PCS	0.486*	0.597*	0.405*	0.648*	0.546*	0.386*
MCS	0.547*	0.394*	0.441*	0.423*	0.511*	0.258*
VAS	0.666*	0.633*	0.456*	0.610*	0.508*	0.572*

Pearson's  $r$  correlation coefficients are shown

MA II Moorehead–Ardelt

Quality-of-Life Questionnaire II, SF-36 Greek version of 36-item Short Form Health Survey, PCS physical component summary, MCS mental component summary, VAS Visual Analogue Scale

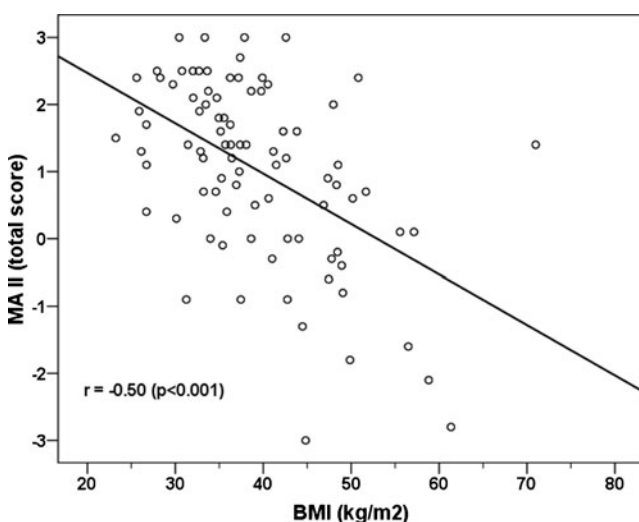
\* $P < 0.001$ ; \*\* $P < 0.05$

effectiveness of surgical treatment by using consistent health status measures.

The validation procedure of the translated questionnaire involved the assessment of reliability and construct validity in the new linguistic and cultural context. We have demonstrated that our translation has excellent reliability and construct validity comparable to those of other studies [13, 14]. Additionally, we observed that the translated version of MA II total score correlates significantly with BMI, age, gender and time-point to surgery. HRQoL was more impaired in

older patients, women and the most obese patients. Postoperative patients demonstrated a better outcome. These findings are consistent with previous reports and support not only the interpretability of the MA II but also the specific use of this questionnaire [30].

Although several obesity-specific HRQoL instruments have been developed, the MA II questionnaire fulfills the need of a simple, one-page, reliable, appropriate and reproducible instrument. It assesses bariatric patients' psychosocial functioning, bridging any linguistic, cultural or educational differences [31, 32]. The assessment of psychosocial status is of utmost importance among the morbidly obese patients due to the risk of social isolation. Obese persons, particularly women and children, are often socially stigmatized, which



**Fig. 1** Scatter dot plot analysis of BMI against MA II total score in the total sample of patients. An inverse correlation between BMI and MA II is shown

**Table 5** Multivariate linear regression analysis of MA II total score

Independent variable <sup>a</sup>	$\beta$ coefficient (standardized)	$t$ statistic	$P$ value
Time-point (post- vs. preoperative)	0.46	6.13	<0.001
BMI ( $\text{kg}/\text{m}^2$ )	-0.31	-4.11	<0.001
Age (year)	-0.20	-3.29	.001
Gender (female vs. male)	-0.17	-2.70	.008

<sup>a</sup> Linear regression model of MA II total score (dependent variable) using age (continuous variable), gender (female and male), BMI (continuous variable) and time-point (pre- and postoperative) as independent predictors

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has been shown to adversely affect their educational, social, financial and marital status. Moreover, overweight individuals are often disqualified from certain occupations and are also discriminated against non-obese individuals [33, 34]. Thus, psychosocial improvement constitutes a key element in the assessment of bariatric surgery outcome. Weight loss is only a surrogate end point that allows an understanding of the progress of the treatment. The final end-points in the treatment of obesity are improvement in morbidity rates, mortality rates and quality of life. Furthermore, the advantage of disease-specific questionnaires over generic instruments of HRQoL is that the former may have higher sensitivity for detecting subtle but clinically relevant alterations in quality of life caused by the condition or treatment under study [35, 36]. Despite the recognition that disease-specific measures differ from general health measures, we observed strong correlations between the physical and mental components scores of the SF-36 as well as the VAS with the Greek-translated MA II scale. SF-36 has been established as excellent cross-cultural instrument for different patient groups and across different countries [37–39]. Through cross-validation with the SF-36, MA II has demonstrated its strong cross-cultural potential.

Possible limitation of the present study is that we did not evaluate the applicability of the MA II in Greek language. Applicability refers to the average length of time needed to fill out the questionnaire and the degree of difficulty among subjects in understanding the content. However, participants did not report any difficulty in understanding the MA II questionnaire.

In conclusion, a Greek version of the MA II questionnaire has been generated and shown to be a valid and reliable instrument for measuring HRQoL in morbidly obese patients before and after bariatric surgery. Our data support that the Greek version of the instrument has adequate psychometric properties, comparable to those of other MA II validation studies in several languages. The clinical applicability of the Greek version of MA II and its potential role in the management of morbidly obese patients remains to be further investigated.

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