#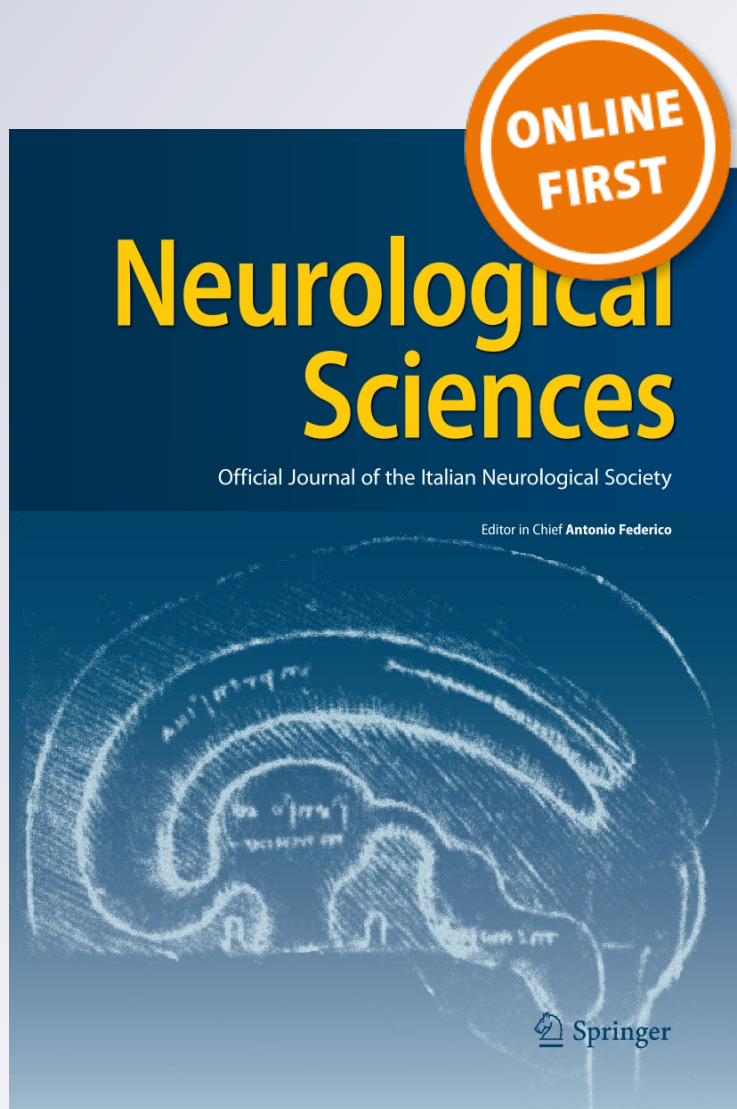 An initial validation of the Italian Mishel Uncertainty Illness Scale (MUIS) for relapsing remitting multiple sclerosis patients

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An initial validation of the Italian Mishel Uncertainty Illness Scale (MUIS) for relapsing remitting multiple sclerosis patients

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Abstract Multiple sclerosis is a chronic disease, likely to condition patients' daily living and quality of life: given the unpredictability of frequency and severity of the attacks, patients experience a high level of uncertainty. While there have been many analyses whose purpose was to monitor multiple sclerosis (MS) patients' quality of life, the role of uncertainty, that is peculiar to the disease, has not been adequately considered so far. The present study is aimed at filling this gap by validating for Italian MS patients the Mishel's Uncertainty Illness Scale (MUIS). The MUIS has been developed in the USA context in order to assess four aspects of uncertainty: *ambiguity*, *complexity*, *inconsistency* and *unpredictability*. It has been largely applied in the cancer, cardiac and chronic illness population. Data employed in this study have been collected at two neurological centres in Messina (IRCCS Centro Studi Neurolesi "Bonino Pulejo" and Policlinico di Messina) in the first semester of 2013 and refer to 120 MS patients. The confirmatory factor analysis described in this study validates two of the four dimensions of MUIS, namely *ambiguity* and *inconsistency*. The validation, though partial, of the MUIS, allows the use of this instrument in studies investigating quality of life for Italian patients.

Keywords Uncertainty in illness · Multiple sclerosis · Quality of life

Introduction

Multiple sclerosis (MS) is a chronic and progressive illness, representing one of the most common causes of neurological disability in young adults [1]. In Italy, MS patients are about 63,000, and 1,800 new patients are diagnosed every year. MS onset often occurs in people aged between 20 and 30 years, and the prevalence is higher for women (www.aism.it).

It is difficult to forecast the long-term outcome of the disease, as well as the effect of the pharmacological treatment: both these factors may depend on the type of MS (relapsing vs. progressive), the individual's characteristics, the symptoms experienced and the degree of disability over time [2].

The frequency and severity of the attacks are unpredictable: patients cannot ascertain the meaning of illness-related events or the time when they will occur [3]. These circumstances impact their daily living and health-related quality of life. Hence, patients affected by MS experience a high level of uncertainty due to illness that is likely to condition their quality of life.

While there have been many analyses whose purpose was to monitor MS patients' health-related quality of life that has been frequently assessed through validated scales [4], the uncertainty deriving from MS has been the object of only few international studies [5–10].

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The present study is aimed at filling this gap by validating for Italy the Mishel Uncertainty of Illness Scale (MUIS) for adults [11]. This scale has been developed in the USA with the objective of assessing the uncertainty associated with the course and the treatment of illness. The initial MUIS was conceptualized by Mishel in 1981 [12]. The diverse subsequent re-elaborations of the first version of the questionnaire led to a four-factor structure encompassing 33 items [3]. The latter can be grouped, so has to identify four dimensions of uncertainty: *ambiguity*, containing 13 items and concerning the indistinctness of "[T]he cues about the state of illness that are vague and indistinct and tend to blur and overlap; *complexity*, consisting of seven items taking into account "[T]he cues about the treatment and the system of care that are multiple, intricate and varied"; *inconsistency*, with seven items referring to the information received "that either changes frequently or is not in accord with information previously received"; *unpredictability*, consisting of five items referring to "the lack of contingency between illness and treatment cues and illness outcome".[1]

Items related to *ambiguity* pose questions associated with symptoms "*that continue to change unpredictably*" (item 9), or "*The course of my illness keeps changing. I have good and bad days*" (item 17) and the impossibility to make plans about the future ("*Because of the unpredictability of my illness, I cannot plan for the future*", item 16). Items about *complexity* look, for example, at the uncertainty that may be related to the treatments followed by patients ("*The purpose of each treatment is clear to me*", item 6) as well as to the clarity of the communication with the medical staff ("*The doctors and nurses use everyday language so I can understand what they are saying*", item 33 of the original version). *Inconsistency* items examine the congruity of the patients information concerning their health conditions: "*I don't know what is wrong with me*" (item 1), or "*I have a lot of questions without answers*" (item 2). Finally, *unpredictability* considers the anticipation of the possible evolution of the disease, as "*I can predict how long my illness will last*" (item 12) or "*I'm certain they will not find anything else wrong with me*" (item 27).

Each of these dimensions can be the object of a separate validation through a factorial analysis.

The MUIS has been used in many health-related studies and has been found to possess sound psychometric properties across several chronic diseases, including MS [3, 11–16], cancer and rheumatoid arthritis [17–20]. Studies of the scale's internal reliability (Cronbach's α) have reported moderate-to-high values ranging from 0.74 to 0.92 [3].

Though MUIS has been employed in diverse chronic illness populations abroad, to our knowledge, it has never been used for MS in Italy. For this reason, its validation has to be meant as the preliminary step for further analyses carried out for Italy, aimed at investigating the impact of uncertainty for MS patients and the possible consequences in terms of patients behaviour (for example, the compliance or not compliance towards therapies).

In the following sections, the MUIS is described, together with the steps followed in translating the questionnaire and administering it to patients; then, the results of the validation are presented. Some comments, together with possible further developments of the analysis, will conclude the paper.

Materials and methods

The adult form of the MUIS used for hospitalized adult [3, 11, 12] was translated into Italian and adapted to the context under investigation.

As respondents were MS patients—not including hospitalized acute patients suffering from a relapse—the items 18 and 31 of the original version, referring specifically to hospitalization, were removed. These items were: "*It's vague to me how I will manage my care after I leave the hospital*" and "*I can depend on the nurses to be there when I need them*".

The translation from English into Italian has been performed by the authors, after careful discussions with the team of psychologists at the IRCCS Centro Studi Neurolesi "Bonino Pulejo" in Messina, about the most appropriate language to use (i.e. use of terms that could be easily understood by patients).

The translated version of the questionnaire has then been submitted to a professional translator, asking to re-translate it into English. The re-translated version was not dissimilar from the original questionnaire developed by Mishel.

Very little modifications to the original MUIS were done. Though the translation was aimed at guaranteeing semantic equivalence, following the advices for administering MUIS [11], the word "*pain*" in items four and seven of the original questionnaire ("*It is unclear how bad my pain will be*" and "*When I have pain, I know what this means about my condition*") was removed when translating the questionnaire and changed with the corresponding Italian word for "*symptoms*". This was because the dimension "*pain*" might not be the primary concern of SM patients.[2] The final questionnaire contained 31 of its original 33 items.

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[1] See [11], pages 6-7.

[2] The authors would like to thank Prof. F. Patti of the University of Catania for this insight.

The questionnaire was administered to 120 MS patients at two neurological centres in Sicily, IRCCS Centro Studi Neurolesi in Messina and Policlinico of Messina, in the time interval January–June 2013.

The centres involved in the study follow MS patients living in the regions of Sicily and Calabria; they are located in the province of Messina, where 769 patients reside, over a population of more than 5,500 Sicilian patients in 2010 [21].

In the period between January and June 2013, all relapsing remitting MS outpatients who undertook a control visit were considered for inclusion.

The 120 individuals admitted for the study satisfied the following criteria: clinically definite or laboratory supported MS, written informed consent and knowledge of their MS diagnosis. Exclusion criteria were as follows: primary progressive multiple sclerosis, secondary progressive multiple sclerosis and lack of written informed consent.

The objective of the study was clearly explained by the neurologists: all patients agreed to be interviewed and answered to almost all questions. The interviews took place at the neurological centres before the control visit. Further 11 patients were interviewed at the office of the *Associazione Italiana Sclerosi Multipla* (AISM) in Messina.

The interviewers were psychologists or physicians. The MUIS was inserted in a worksheet which also included other questions concerning patients' clinical history and health-related quality of life. The EuroQoL 5D (EQ-5D) was administered too, with the purpose to gather objective information about patients' actual health status (http://www.euroqol.org/home.html).

The interviewers received a brief training in order to standardize the administration of the questionnaires.

The items of MUIS are rated on 5-point Likert scale: 5 = "strongly agree", 4 = "agree", 3 = "I do not know—undecided", 2 = "disagree", 1 = "strongly disagree". The patient had to select the degree to which she/he agreed or disagreed with statements or undecided/did not know.

The interviewer read aloud the items for patients who had difficulty in reading and/or in writing and verified if each item had been correctly meant by the patient by asking him/her to explain it with his/her own words.

The MUIS was well accepted and understood by patients who showed to be cooperative. They easily completed the questionnaire, except for item 1 ("*I don't know what is wrong with me*"), item 8 ("*I do not know when to expect things will be done to me*"), and item 24 ("*It is difficult to determine how long it will be before I can care for myself*"), for which a high percentage of "I do not know" was reported. The compilation of MUIS took 10–15 min; 25–30 min was needed to fill the whole worksheet.

The data collected were organized into a database employed in a confirmatory factor analysis (CFA) that was run for each of the four MUIS dimensions using the statistical package MPLUS [22]. The choice of an exploratory factor analysis rests on the fact that our main objective was to test an *a priori* factor theory [23]; in fact, we wanted to verify whether the underlying factor structure, already identified by Mishel [3, 11–13], holds for MS patients in another cultural setting, such as the Italian one.

Results

Table 1 shows some descriptive statistics related to the information collected through the questionnaires.

Patients were, on average, 39 years old: only two patients were older than 60 years. On average, they were diagnosed at 28 years old; 73 % were females. This is in line with the epidemiological course of the disease that has its beginning between 20 and 30 years old and concerns more women than men.

As far as education was concerned, 42.5 % (51 patients) completed high school, 28 patients (23.3 %) proceeded to academic and post graduate education. More than half of the respondents, 59.6 % (71 patients), were married or lived with someone, the remaining people declared to be single, widowed or divorced.

Patients suffered, on average, nine relapses. Almost half of the patients in the sample (55 patients) declared to have experienced, overall, up to three relapses following the diagnosis; 10 patients have not experienced any relapse after the disease started; about 10 % of patients had not experienced any relapse in the last 5 years. In fact, given the unpredictability of the disease, it could take a long time since new symptoms appear.

Only 16 patients (3.2 %) suffered from other diseases, among which the most common was thyroiditis.

After several years from the diagnosis, patients acquire a wider knowledge of the disease. In fact, 75 % of them declared to know more about MS and <3 % recognized to be confused and to know less than before. Physicians were the main source of information (80.9 %), together with internet, magazines and TV (68.6 %); other patients' advice was considered as a less reliable source of information (21.9 %).

Fears about the course of the disease mainly concerned the loss of autonomy (57.8 %), followed by the increased disability (44.3 %). The average score attributed to the level of health before the diagnosis was, on average, over 9 on a scale from 0 to 10. However, at the time of interview, almost 76 % of patients declared that, compared to the previous year, their health conditions were still acceptable or good.

Table 1 Descriptive statistics

Demographic statistics and information about the last relapse

Variable	Mean	SD	Min	Max
Age	39.4	9.79	19	73
Age at diagnosis	28.2	8.40	10	60
Number of relapses	9	13.36	0	100
Health status before MS (0–10)	9.19	1.31	5	10
Other information (%)				
Gender (male)	26.6			
Other pathologies	3.2			
Marital status				
Married	59.7			
Single	30.2			
Widow	3.4			
Divorced	6.7			
Education				
Primary school	34.2			
High school	42.5			
University	17.5			
Postgraduate	5.8			
Time since last relapse				
<6 months	34.2			
6–12 months	16.2			
1–3 years	31.5			
3–5 years	7.2			
>5 years	9.9			
I do not remember/not answer	1			
Last relapse severity				
Less severity	23.8			
Same severity	40.4			
More severity	33			
I do not remember/not answer	2.8			
Symptoms since MS onset				
Motor disturbances (diminished strength, paresis, difficulty in movement)	84			
Balance and coordination problems	73.9			
Sensitivity disturbances	79.1			
Visual problems	52.1			
Diplopia	31.7			
Speech and voice problems	37.5			
Sphincteric problems	50			
Other	27.5			
Health status today				
Excellent	7.5			
Very good	11.8			
Good	28.6			
Acceptable	37			
Poor	15.1			

Table 1 continued

Demographic statistics and information about the last relapse

Variable	Mean	SD	Min	Max
Health status comparing to last year				
Much better	10.9			
Slightly better	11.8			
Unchanged	52.9			
Slightly worse	17.7			
Much worse	6.7			
Information about the disease				
Unchanged	22.5			
Increased	75			
Diminished	2.5			
Information received from (more answers)				
Physicians	80.9			
Internet, newspapers, TV	68.6			
Other patients	21.9			
Other	16.2			
Fears due to the disease (more answers)				
Difficulty in performing usual activities	17.4			
Loss of autonomy	57.8			
Increased disability	44.3			

The CFA performed for each of the four MUIS dimensions gave the results reported in Table 2. Each item was specified to load onto a single scale: at the end, two dimensions were basically validated, namely *ambiguity* and *inconsistency*.

The reliability coefficient, calculated for the *ambiguity* dimension containing 12 of the 13 items originally proposed was satisfactory (Cronbach's $\alpha = 0.828$). The CFA, because of the magnitude of the standardized coefficients (≤ 0.40), suggested to drop items 3 and 14. After these changes, the ten-item model exhibited positive and highly significant standardized regression weights. The fit indexes obtained were satisfactory.

The original MUIS *inconsistency* dimension exhibited a satisfactory value of Cronbach's α (0.713). The CFA confirmed the seven-item model proposed by [3], as all the regression weights obtained exhibited positive and highly significant standardized regression weights and highly satisfactory fit indexes.

The dimensions *complexity* and *unpredictability* were not confirmed as they did not meet the recommended requirement concerning the Cronbach's α value.

The reliability coefficient, calculated for the *complexity* dimension containing six of the seven items originally proposed by Mishel[3], was not satisfactory (Cronbach's

Table 2 Standardized coefficients, Cronbach's α and fit indexes

Ambiguity by	Estimate (standard error)	Inconsistency by	Estimate (standard error)
Item 4	0.463* (0.073)	Item 1	0.659* (0.079)
Item 8	0.420* (0.075)	Item 2	0.457* (0.087)
Item 9	0.787* (0.049)	Item 5	0.519* (0.106)
Item 13	0.529* (0.074)	Item 11	0.411* (0.092)
Item 16	0.783* (0.046)	Item 19	0.706* (0.085)
Item 17	0.742 (0.053)	Item 22	0.641* (0.073)
Item 20	0.644* (0.060)	Item 29	0.669* (0.093)
Item 23	0.490* (0.071)		
Item 24	0.716* (0.051)		
Item 26	0.703* (0.056)		
Cronbach's α = 0.819		Cronbach's α = 0.713	
RMSEA = 0.039		RMSEA = 0.031	
90 % CI 0.000 0.0829		90 % C·I. 0.000 0.114	
Prob. RMSEA ≤ 0.05 0.590		Prob. RMSEA ≤ 0.05 0.559	
CFI = 0.995		CFI = 0.996	
TLI = 0.989		TLI = 0.990	

* $p = 0.000$

Table 3 Correlation between the EQ-5D, a*mbiguity* and *inconsistency* scores

	EQ-5D score	Ambiguity score	Inconsistency score
EQ-5D score	1		
Ambiguity score	−0.45*	1	
Inconsistency score	−0.28*	0.64*	1

* $p < 0.001$

α = 0.536). Though by deleting items six and seven the value of the reliability coefficient improved, it did not achieve the recommended threshold of 0.600 (Cronbach's α = 0.558).

The low value of the Cronbach's α (=0.500), calculated for the original five-item *unpredictability* dimension, led to the elimination of items 21 and 27; after these changes, the value of the Cronbach's α, was still too low (α = 0.558).

Finally, as the EQ-5D had been administered as well, so that information about health-related quality of life was also available, we calculated the correlation between the EQ-5D score and, respectively, the *ambiguity* and the *inconsistency* scores. The latter was calculated by adding the scores of all the relevant items, as suggested by Mishel [3].

Table 3 shows how there is a statistically significant negative correlation between the EQ-5D score and the *ambiguity* and the *inconsistency* score. As each dimension of MUIS is scored in the direction of uncertainty, while the EQ-5D is scored in the direction of perfect health, the results suggest that the less healthier the patient, the more *ambiguity* and *inconsistency* impact patients' everyday life [24].

Discussion and conclusions

Although MUIS, in its latest version, consists of four dimensions, the procedure carried out in this study led to the validation of two of them, *ambiguity* and *inconsistency*. To our knowledge, MUIS has not been previously applied in Italy to assess MS-related uncertainty. Hence, its partial validation provides researchers with a further instrument for investigating a crucial aspect related with the MS patients' quality of life: the uncertainty determined by the disease.

The two dimensions validated concern the cues about the state of illness that are indefinite and tend to blur (*ambiguity*) and the information received that may continuously change (*inconsistency*) [3].

Ambiguity is meant to assess patients' sense of inability to control and govern those aspects of their health conditions affected with the evolution of MS, together with the intrinsic uncertainty associated with its treatment. Therefore, the measurement of *ambiguity* allows to observe patients' individual reactions to those aspect of the disease they cannot fully master.

In future developments of the analysis, the assessment of *ambiguity* could be considered together with the assessment of depression, by means of questionnaires such as the Beck Depression Index. The replies to each single *ambiguity* item could help in monitoring patients' emotional responses to MS diagnosis and to the course of this disease, and it might be useful to define appropriate strategies of coping with the MS, in order to avoid the development of further affective symptoms.

The assessment of *inconsistency* is based on objective factors, such as the information received, that, once again, may be helpful in developing some coping strategies. This dimension looks at the asymmetric information, characterizing the patient–physician relationship and allows us to consider patient's quest for understanding her health condition.

In this light, for example, it has to mean item 2: "*I have a lot of questions without answers*" or item 8 "*I do not know when to expect things will be done to me*". It is straightforward how an improvement in the score for this dimension could be obtained by developing a better communication strategy with the physicians: patients should receive detailed answers and should be encouraged to manifest their fears and doubts. This would make them more aware of the disease and might boost their active role in defining and personalize their treatment, together with the neurologists.

In conclusion, this study suggests that the Italian version of MUIS for adult is easy to administer and well accepted by MS patients. It offers an abridged validated version of two of the four original scales which may allow us to retrieve information that can be employed in analyses focusing MS patients' health-related quality of life.

We are aware that the above conclusions have to be accepted with caution as the results are drawn on a sample of only 120 respondents. For this reason, we refer to our results as an *initial* validation of MUIS for the MS Italian patients. Nevertheless, as suggested by Barrett [25], considerations of the small size of the entire population which the sample intends to represent, as it is often the case in medical research, should justify the use of a small sample. In this light, further developments of the analysis may consider the widening of the sample size, including observations from other neurological centres and/or related to groups of patients following different pharmacological therapies. *Ambiguity* and *inconsistency* could be assessed, for example, for individuals treated with interferon-β or glatiramer acetate ("first line" treatments) vs. those treated with natalizumab or fingolimod ("second line" treatments), so to appraise if "first line" or "second line" treatments impact differently on patients' perception of uncertainty. A larger sample size not only would give robustness to our findings concerning *ambiguity* and *inconsistency,* but would also allow us to exclude (or eventually include) with stronger evidence the existence of the other MUIS factors *complexity* and *unpredictability.* In addition, as other versions of the MUIS are available, as that one directed to relatives and caregivers, another possibility might be that of proceeding to the validation of this other instrument. The analysis might be performed on a wider population, as each patient may count on more than one caregiver, and could help to assess the whole impact of MS on patients' and their families' lives.

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