

Psychometric properties of the Croatian version of the Multiple Sclerosis International Quality of Life Questionnaire

Abstract

Aims: This study aimed to investigate the psychometric properties of the Multiple Sclerosis International Quality of Life (MusiQoL) questionnaire for Croatian-speaking MS patients.

Methods: Eighty-two patients with multiple sclerosis (MS) participated in the study (51 female and 31 male, average age 42.6 ± 11.9 years). The instrument used in this study was MusiQoL questionnaire which was translated into Croatian language using forward-backward translation method. The data was descriptively analysed. Cronbach's α internal consistency coefficient and test-retest analyses were conducted for reliability. Pearson's correlation coefficient (r) was used to analyse the relationship between the MusiQoL index and dimensions. Exploratory factor analysis was conducted to test construct validity.

Findings: The mean value (\pm standard deviation) for MusiQoL index measured 64.18 ± 17.13 , while the dimension scores ranged from 54.73 ± 28.12 to 84.05 ± 18.85 . High internal consistency was found for the MusiQoL index (Cronbach's α : 0,93). All dimensions of the MusiQoL showed high internal consistency (Cronbach's α : 0.75-0.95). The intra-class correlation coefficient of the MusiQoL dimensions and MusiQoL index were 0.949-0.971 and 0.911, respectively. There was a moderately to strong relationship between MusiQoL index with dimensions (r : 0.43-0.86). Bartlett's significance test of the correlation matrix is high and significant ($\chi^2=2028.41$, $p < 0.001$). The Kaiser-Meyer-Olkin coefficient was calculated as 0.801. The extracted factors explained 66.10% of the variance and the range of factor loading was 0.52-0.90.

Conclusion: The Croatian version of the MusiQoL questionnaire is valid and reliable in measuring quality of life among Croatian-speaking MS patients. It is especially useful for measuring health-related quality of life in terms of clinical practice.

Keywords: Multiple Sclerosis; Quality of Life; Patients; Reliability; Validity; Croatia

Introduction

Multiple sclerosis (MS) represents chronic progressive inflammatory demyelinating disease of the central nervous system (CNS) [1]. MS is also one of the most common diseases that affects CNS, it has lifetime risk of 1 in 400 cases [2] and it causes performance decrease in about 75% of patients [3]. Health-related quality of life (HRQoL) indicators often lay on questionnaire that assesses health status of individuals [4-7].

When measuring and assessing HRQoL of MS patients, it is very important to ensure that patients' perception is also accurately taken into consideration [8]. Back in 2004 and 2005, two papers reported 20 questionnaires designed for MS patients [9,10], and today the number of MS orientated questionnaires is even larger. Authors of mentioned papers reported that none of those 20 questionnaires from that time

period were specifically reflecting the patients' point of view on impact of MS on their everyday life and that only few of them included self-reported measures.

Because of earlier mentioned problems and lapses of questionnaires designed for MS patients, Simeoni and colleagues [11] collaborated with neurologists from 15 countries and offered new questionnaire for MS patients, the Multiple Sclerosis International Quality of Life (MusiQoL) questionnaire. MusiQoL is a questionnaire that includes the views of patients with MS about the impact of the disease on their daily lives and assesses various dimensions of their lives [12].

Questionnaires designed for measuring HRQoL of MS patients that are currently available and most frequently used in clinical practice in Croatia are Functional Assessment of Multiple Sclerosis (FAMS) [13], Multiple Sclerosis Impact Scale 29 (MSIS-29) [14], and Multiple Sclerosis Quality of Life-54 Instrument (MSQOL-54) [15]. Reason why we chose to validate the Croatian version of the MusiQoL questionnaire for purpose of assessing HRQoL of MS patients rather than use already translated and clinically used questionnaires in Croatia is mainly because of MusiQoL questionnaire's specific design, which is easy to administer, it is easily understandable by participants, and it covers several domains of life. Other advantages also include the short time required to complete the questionnaire [11]. All mentioned advantages of MusiQoL questionnaire actually fill in the gaps that previous studies on MS quality of life (QoL) tools conducted in Croatia had. This study aimed to investigate the psychometric properties of the MusiQoL questionnaire for Croatian-speaking MS patients.

Materials and Methods

Eighty-two MS patients participated in this study (51 female and 31 male) with average age 42.6 ± 11.9 years. All patients were required to sign a statement of informed consent before we started research. Research problem was examined using the self-administrated patient-based HRQoL instrument MusiQoL questionnaire which are divided into 9 different dimensions (ADL-activity of daily living, PWB-psychological well-being, SPT-symptoms, RFr-relationships with friends, RFa-family relationships, RHCS-relationship with healthcare system, SSL-sentimental and sexual life, COP-coping and REJ-rejection) [12]. We received approval from the original author to translate the MusiQoL questionnaire into Croatian. Forward-backward translation was used to translate the original version into Croatian language. Two bilingual researchers translated the original tool into Croatian in forward-translation stage. Then, in the back-translation stage, third translator, who had not previously encountered the original tool, translated the Croatian version back into English. Mentioned translation and adaptation procedures are described in detail by Guillemin and colleagues [17] and Beaton and colleagues [17]. The sample size was determined using G*Power setting to Cohen's medium effect size of 0.5, significance level 0.05, and statistical power of 0.80. The data was descriptively analysed (mean, standard deviation, mean and interquartile range). Two main analyses were performed for reliability. Firstly, Cronbach's α coefficient value was calculated for each dimensions of the MusiQoL questionnaire and for the MusiQoL index in order to evaluate whether the items of MusiQoL were consistent with each other. A score of Cronbach's α values >0.70 was considered

excellent for internal consistency [18]. Secondly, test-retest reliability was evaluated. For the reproducibility of the MusiQoL, the similarity between the two separate assessment was observed with the intra-class correlation coefficient (ICC, 95% CI). An ICC value above 0.80 is considered perfectly reliable [19]. The normality of the distribution for variables was verified by the Shapiro-Wilk test. To evaluate convergent validity, Pearson's correlation coefficient (r) was used to analyse the relationship between the MusiQoL index and dimensions. If the r-value >0.50 the validity was interpreted as strong, if it is between 0.35 and 0.50 was considered moderate and weak if the value <0.35 [20]. Construct validity was examined using exploratory factor analysis (EFA) under the principal components model with the varimax rotation. The sampling adequacy was deemed sufficient, with a Kaiser-Meyer-Olkin (KMO) value of 0.7-1.0, while Barlett's test of sphericity (BTS) showed significance at $p < 0.001$, indicating the usefulness of EFA for data analysis [21,22]. The scree plot, the percentage of the variance explained by the factorial model and the patterns of the factor loadings were examined.

Findings

The mean score (\pm standard deviation) for MusiQoL index score measured 64.18 ± 17.13 . Cronbach's α for MusiQoL index and dimensions ranged from 0.75-0.95, indicating good to excellent internal consistency (Table 1). The test-retest reliability of all MusiQoL dimensions and MusiQoL index were excellent. The ICC score of the MusiQoL dimensions and MusiQoL index were 0.949-0.971, and 0.911, respectively (Table 2). There was a strong relationship between MusiQoL index with ADL, PWB, SPT, SSL, COP and REJ ($r > 0.50$, $p < 0.05$). MusiQoL index was moderately related to RFr, RFa and RHCS ($r < 0.50$, $p < 0.05$) (Table 1).

Table 1. Descriptive statistics, internal consistency and correlation of the MusiQoL dimensions and MusiQoL index

MusiQoL (n of items)	Mean (SD)	Median (IQR)	Cronbach's α	r
ADL (8)	54.73 (28.12)	55 (40)	0.95	0.86*
PWB (4)	61.89 (24.17)	63 (37)	0.86	0.75*
SPT (4)	62.65 (24.61)	63 (44)	0.82	0.73*
RFr (3)	57.01 (28.46)	58 (33)	0.86	0.43*
RFa (3)	75.31 (25.31)	83 (33)	0.84	0.46*
RHCS (3)	84.05 (18.85)	92 (33)	0.81	0.48*
SSL (2)	67.53 (28.72)	75 (50)	0.92	0.53*
COP (2)	60.67 (27.37)	63 (50)	0.75	0.63*
REJ (2)	74.09 (26.04)	75 (50)	0.77	0.74*
Index (31)	64.18 (17.13)	62 (26)	0.93	

MusiQoL - Multiple Sclerosis International Quality of Life questionnaire; n - number; SD - standard deviation; IQR - interquartile range; r - Pearson's correlation coefficient; ADL - activities of daily living; PWB - psychological well-being; SPT - symptoms; RFr - relationship with friends; RFa - relationship with family; RHCS -

relationship with healthcare system; SSL - sentimental and sexual life; COP - coping; REJ - rejection; * - statistically significant at $p < 0.05$

Table 2. The test-retest reliability of the MusiQoL dimensions and MusiQoL index

MusiQoL (n of items)	Test Mean (SD)	Retest Mean (SD)	ICC (95% CI)
ADL (8)	54.73 (28.12)	58.91 (24.38)	0.949 (0.92-0.96)
PWB (4)	61.89 (24.17)	64.91 (21.19)	0.949 (0.92-0.96)
SPT (4)	62.65 (24.61)	64.79 (21.49)	0.952 (0.93-0.97)
RFr (3)	57.01 (28.46)	59.85 (23.56)	0.955 (0.93-0.97)
RFa (3)	75.31 (25.31)	76.15 (21.28)	0.962 (0.94-0.98)
RHCS (3)	84.05 (18.85)	84.37 (16.44)	0.960 (0.93-0.97)
SSL (2)	67.53 (28.72)	69.85 (24.70)	0.968 (0.95-0.98)
COP (2)	60.67 (27.37)	63.26 (24.44)	0.963 (0.94-0.97)
REJ (2)	74.09 (26.04)	75.76 (22.36)	0.971 (0.96-0.98)
Index (31)	64.18 (17.13)	68.65 (14.15)	0.911 (0.87-0.94)

MusiQoL - Multiple Sclerosis International Quality of Life questionnaire; n - number; SD - standard deviation; ICC - intra-class correlation coefficient; CI - confidence interval; ADL - activities of daily living; PWB - psychological well-being; SPT - symptoms; RFr - relationship with friends; RFa - relationship with family; RHCS - relationship with healthcare system; SSL - sentimental and sexual life; COP - coping; REJ - rejection

BTS of the correlation matrix is high and significant ($\chi^2 = 2028.41$, $p < 0.001$). The KMO sampling adequacy index was 0.801, which shows that the correlation matrix of the measuring instrument variables is suitable for factorization. The fact that the calculated values were statistically within the desired range showed that the sample size and structure of the study were suitable for EFA. According to the Gutman-Kaiser criterion, six factors with significant eigenvalues (11.00, 3.57, 2.85, 2.19, 1.54 and 1.28) were obtained. The extracted factors which consists of 31 items and 6 dimensions explained 66.10% of the variance. The factor loadings calculated as a result of the EFA are given in Table 3.

Table 3. Exploratory factor analysis of the MusiQoL questionnaire

Variable	Factor loading
Factor 1: Activities of daily living and rejection	
Had difficulty walking or moving outside?	0.87
Had difficulty with outdoor activities: i.e. shopping, going out to a movie...?	0.85
Had difficulty walking or moving around at home?	0.90
Been troubled by your balance or walking problems?	0.70
Had difficulty with leisure activities at home: i.e. do-it-yourself, gardening...?	0.87

Had difficulty with your occupational activities: i.e. integration, interruption, limitation...?	0.82
Been quickly tired?	0.70
Been short of energy?	0.65
Been upset by the stares of other people?	0.57
Been embarrassed when in public?	0.56
Factor 2: Psychological wellbeing and coping	
Felt anxious?	0.63
Felt depressed or gloomy?	0.82
Felt like crying?	0.71
Felt nervous or irritated by a few things or situations?	0.68
Felt that your situation is unfair?	0.67
Felt bitter?	0.58
Factor 3: Relationships with spouse/partner or family	
Talked with your spouse/partner or your family?	0.57
Felt understood by your spouse/partner or your family?	0.67
Felt encouraged by your spouse/partner or your family?	0.66
Felt satisfied with your love life?	0.85
Felt satisfied with your sex life?	0.74
Factor 4: Relationships with friends	
Talked with your friends?	0.66
Felt understood by your friends?	0.85
Felt encouraged by your friends?	0.87
Factor 5: Relationship with healthcare system	
Been satisfied with the information on your disease or the treatment given by the doctors, nurses, psychologists...taking care of your MS?	0.74
Felt understood by the doctors, nurses, psychologists...taking care of your MS?	0.73
Been satisfied with your treatments?	0.72
Factor 6: Symptoms	
Been troubled by loss of memory?	0.72
Had difficulty concentrating: i.e. when reading, watching a film, following a discussion...?	0.65
Been troubled by your vision: worsened or unpleasant?	0.61
Experienced unpleasant feelings: i.e. hot, cold...?	0.52

Discussion

Even though there are some papers in Croatia written in QoL of MS patients, to the best of our knowledge this is the first study in Croatia which investigates HRQoL for MS patients using Croatian version of MusiQoL questionnaires. We found much necessary and important to investigate MS patients' HRQoL because of mentioned and proved statement that as disease progresses, about 75% of MS patients face performance decrease in activities of daily living [3]. Therefore, MS which results in a wide range of clinical manifestations has large impact on HRQoL, and to

improve HRQoL of MS patients, it is first necessary to make as complete and as high-quality assessment of HRQoL as possible.

MusiQoL was earlier translated, validated and reliability assessed in many countries including Korea [4], Spain [7], Poland [12], Norway [23] and Greece [24]. English version was also validated in Asian region including countries of Singapore, India and Malaysia [25].

Our analyses demonstrated the construct validity, internal consistency, and reproducibility of the Croatian version of the MusiQoL. This study confirmed the process of validation of the MusiQoL version translated into the Croatian language and underscores its potential utility as an outcome measure in the clinical-trial setting. Our results for the construct validity, internal consistency, and reproducibility of the MusiQoL were similar to those of international patient samples. They are also in line with previous differential item functioning analyses that have yielded satisfactory results across countries [11]. The present findings, in combination with those of the initial validation report [11], thus indicate a major strength of the MusiQoL, that is, the simultaneous process of validation in different countries around the world.

Huh and colleagues validated Korean version of MusiQoL questionnaires on patients with MS. As in our research, the internal consistency reliability was high for all MusiQoL dimensions (Cronbach's α ranged from 0.77 to 0.96). Highest measured index MusiQoL score was 49.88 ± 12.86 , which is noticeably lower than index score in our sample [4]. Mentioned results in terms of measuring validity of HRQoL questionnaires are different to ones reported by other authors in similar research [11,23,26].

Validation of the Spanish version of MusiQoL was made by Fernández and colleagues on MS sample patients. Only RFa and RHCS dimensions of MusiQoL did not reach high internal consistency with Chronbach's α lower than 0.70 which is worse result than one measured in our study. On the other hand, index score that was reported measured 70.32 ± 13.71 which is higher than 64.18 ± 17.13 that was measured in our sample [7].

Jamroz-Wiśniewska and colleagues validated Polish MusiQoL version. Cronbach's α for dimensions ranged between 0.67 and 0.90 with SSL dimension lower than 0.70 and therefore worse internal consistency than one reported in our study. Highest mean value was measured for SPT dimension (67.10) and lowest RFa dimension (19.00) which was for example second highest evaluated dimension in our sample with mean value of 75.31. Result of MusiQoL index in their sample measured 42.50 ± 12.80 which was again noticeably lower than index score in our sample [12]. Similar results of validation in which it was confirmed that HRQoL was rather correlated with clinical manifestation of disease than with patients' socio-demographic characteristics were also found in earlier studies about MS [27,28].

Beiske and colleagues also validated the MusiQoL questionnaire, their validation was made on Norwegian patients with MS. Cronbach's α ranged from 0.44 and 0.87. On the contrary to our results internal consistency in their research was not measured high for RHCS and REJ dimensions. Index MusiQoL score measured 65.30 ± 10.70 which is the closest to index score of our sample which measured 64.18 ± 17.13 [23].

Triantafyllou and colleagues measured validity and reliability of the Greek version of MusiQoL questionnaire. Only RHCS dimension of MusiQoL did not reach high internal consistency with Chronbach's α lower than 0.70 [24]. RHCS dimension which did not measure high internal consistency in research done by Triantafyllou and colleagues in our research had Cronbach's α coefficient of 0.81, also measuring the highest mean value out of all MusiQoL dimensions with value of 84.05.

Thumboo and colleagues adapted and validated English version of MusiQoL on MS patients from three Asian countries including patients from Singapore and Malaysia combined and separately patients from India. Same as in our research, in sample of MS patients from Singapore and Malaysia all MusiQoL dimension reached high internal consistency. Lowest median score was reported for ADL dimension (56.10), while highest was measured for RFa dimension (80.00). Those results were same as ours in terms of highest and lowest internal consistency and lowest median score. On the other hand, in sample of MS patients from India lowest median score was reported for COP (50.00) and highest also reported for RFa dimension (100). On the opposite to our research, three MusiQoL dimension did not reached high internal consistency. SPT, COP and REJ dimension had values lower than 0.70 [25]. This may be caused by small size of some of mentioned dimensions that are consisted of only two items, as Cronbach's α depends upon the number of items in a dimension [29]. Results of MusiQoL index score measured for sample from Singapore and Malaysia was 67.70 and for sample from India it measured 69.30 [25], which is in both cases slightly higher score than one measured in our sample.

In recent years, studies using MusiQoL as instrument in their research are focused more directly on assessing HRQoL of MS patients than on procedure of MusiQoL validation [30-37]. Three [32,33,36] out of eight earlier mentioned studies that were focused on assessing HRQL of MS patients rather than validating MusiQoL questionnaire, reported lower MusiQoL index score and therefore lower HRQoL of patients with MS than 64.18 ± 17.13 which was measured in our study. Natarajan and colleagues measured HRQoL of MS patients in Oman. Reported MusiQoL index score in their study was 60.60 ± 11.40 . Same as in our research, highest measured MusiQoL dimension was RHCS with value of 81.70 ± 18.90 [32] which is slightly lower than RHCS measured in our study (84.05). Kołtuniuk and colleagues investigated sleep disturbance, degree of disability and QoL of MS patients. They measured index MusiQoL score of 50.73 ± 10.50 [33], which is noticeably lower than one in our research (64.18 ± 17.13) and other studies from this category [30-32, 34-37]. In another study done by Kołtuniuk and colleagues in which they investigated HRQoL, depressive symptoms and physical disability of patients with MS, index MusiQoL score was 58.21 ± 18.06 which is also lower than one in our research. Interesting to point is the fact that RHCS dimension was the highest dimension measured in our research (84.05 ± 18.85), and in mentioned research it was the lowest measured one with value of 49.45 ± 28.28 [36].

Five [30,31,34,35,37] out of eight earlier mentioned studies that were focused on assessing HRQL of MS patients rather than validating MusiQoL questionnaire, reported higher MusiQoL index score and therefore lower HRQoL of patients with MS than 64.18 ± 17.13 which was measured in our study. Fernández and colleagues made research on MS patients, their characteristics and QoL. Their results were very similar to ours in terms of index MusiQoL score, the lowest and the highest measured

MusiQoL dimension. Index MusiQoL score measured in their research was 65.80 ± 14.80 , RHCS dimension with value of 77.80 ± 20.20 was also the highest measured dimension (our RHCS dimension measured 84.05 ± 18.85) and the ADL dimension with value of 54.2 ± 27.1 was also the lowest measured dimension (our ADL dimension measured 54.73 ± 28.12) [30]. Moore and colleagues measured HRQoL of MS patients in Canada, index MusiQoL score of their national sample was 71.90 ± 14.80 [31] which is higher than one in our research. Slightly higher index MusiQoL score that in our research when HRQoL of MS patients was assessed, was also reported by Achtnichts and colleagues measuring 66.70 ± 13.80 [34]. Another higher index MusiQoL that one we measured was reported in research of Dahham and colleagues who assessed HRQoL of patients with MS, its value was 71.33 ± 15.48 [37]. Ismail and colleagues investigated QoL, access to treatment and knowledge of MS patients in Lebanon. In terms of QoL, index MusiQoL score was also higher than one we measured (64.18 ± 17.13) with value of 69.20 ± 11.50 [35].

Finally, most of the results of our study are largely consistent with the international validation study of the MusiQoL made by Simeoni and colleagues made on patients with MS. Index MusiQoL score measured 65.82 ± 14.75 which is again very close to one measured in our sample (64.18 ± 17.13). As often reported in different studies, only RHCS dimension of MusiQoL did not reach high internal consistency with Chronbach's α lower than 0.70. All earlier mentioned data and similarities of our results with results of original MusiQoL validation [11] lends further support to the validity of the Croatian adaptation of this questionnaire.

The following limitations of the present study need to be acknowledged:

1. A limitation of our study is the sampling method, and therefore we recommend random sampling of larger samples for future studies.
2. The sample was relatively small and not predetermined. However, our analyses demonstrating the validity and reproducibility of the MusiQoL in this limited number of patients underscore the robustness of this instrument.
3. Further research is required to test the strengths and weaknesses of the Croatian version of the MusiQoL in a prospective fashion using a larger and more balanced (in terms of clinical subtypes of MS) sample. Indeed, our group plans to perform a prospective, independent study involving additional academic centers from Croatia to evaluate the acceptability and compatibility of the Croatian version of the MusiQoL in the clinical-practice setting. During that study we also plan to implement the MusiQoL in follow-up evaluations to explore and confirm its sensitivity to changes and to evaluate its potential applicability as a prognostic tool.

Conclusion

According to our results, HRQoL of patients diagnose with MS is estimate as moderate to good index of 64.18. That index score seems to be one of the highest index when took into comparison with scores from similar studies on MS patients, including one with original validation. Moreover, the internal consistency reliability is high for all MusiQoL dimensions, which is also not the case in most studies in which MusiQoL has been validated. To sum up, when looking at results of internal consistency and correlation between MusiQoL index and dimensions, this MusiQoL version can be a reliable, valid and feasible instrument for measuring HRQoL in

Croatian-speaking MS patients. In the absence of any other validated HRQoL questionnaire in the Croatian language, the MusiQoL appears to be a promising tool that can be readily applied as an outcome measure for evaluating treatment or managing care in Croatian patients with MS.

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