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**Validation of the translated and cross-culturally adapted  
Malocclusion Impact Questionnaire  
in young people seeking orthodontic treatment in Serbia**

Валидација преведеног и културолошки адаптираног  
Упитника о утицају малоклузија на квалитет живота  
на узорку младих ортодонтских пацијената у Србији

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## Validation of the translated and cross-culturally adapted Malocclusion Impact Questionnaire in young people seeking orthodontic treatment in Serbia

Валидација преведеног и културолошки адаптираног Упитника о утицају малоклузија на квалитет живота на узорку младих ортодонтских пацијената у Србији

### SUMMARY

**Introduction/Objective** This study aimed to translate the original disease specific Malocclusion Impact Questionnaire (MIQ) into Serbian and validate the new version in the cohort of young Serbian orthodontic patients.

**Methods** At the university clinic 154 patients filled out MIQ in Serbian before the start of the orthodontic treatment from which 112 participants completed the same questionnaire after four weeks. Index of Orthodontic Treatment Need (IOTN-DHC) and Peer Assessment Rating (PAR) pretreatment score were recorded. Descriptive statistic, Cronbach's Alpha, Spearman's rho and Exploratory Factor Analysis followed by Parallel Analysis for factor reduction were calculated and analyzed.

**Results** One hundred forty-eight patients with no missing responses (51 male, 97 female), average age  $13.3 \pm 2.00$  years had MIQ total scores mean of  $10,14 \pm 7,451$ . Internal reliability ( $\alpha = 0.913$ ), external reliability ( $\rho = 0.906$ ;  $p = 0.000$ ), construct validity tested by MIQ total scores and two global question scores correlations ( $\rho = 0.682$ ;  $p = 0.000$  and  $\rho = 0.366$ ;  $p = 0.000$ ), as well as clinical validity tested by correlations of MIQ total scores with PAR pretreatment scores ( $\rho = 0.181$ ;  $p < 0.05$ ), and IOTN-DHC scores ( $\rho = 0.192$ ;  $p < 0.05$ ) were positive and statistically significant. One item factor was extracted and explained great part of the cumulative variance.

**Conclusion** Reliability and validity of the translated and cross-culturally adapted MIQ in Serbian is satisfactory. It could be used for malocclusion related quality of life assessments in young Serbian orthodontic patients.

**Keywords:** MIQ, malocclusion impact questionnaire; quality of life; malocclusion; cross-cultural adaptation; validation

### САЖЕТАК

**Увод/Циљ** Циљ студије је био да се валидира преведена и културолошки прилагодјена оригинална верзија специфичног упитника о утицају малоклузија на квалитет живота (енгл. *Malocclusion Impact Questionnaire, MIQ*) на узорку младих ортодонтских пацијената у Србији.

**Метод** На универзитетској клиници 154 пацијента су попунила *MIQ* на српском језику пре почетка ортодонтске терапије. Четири недеље касније, 112 пацијента је поново попунило идентичне упитнике. Мери је индекс потребе за ортодонтском терапијом (енгл. *Index of orthodontic treatment need, IOTN*) и индекс резултата ортодонтске терапије (енгл. *Peer Assessment Rating, PAR*) пре терапије. Урађена је дескриптивна статистика, тест интерне конзистентности (Кронбахова  $\alpha$ ), корелације (Спирманов  $\rho$ ), експлоративна факторска анализа за екстракцију и паралелна анализа за редукцију броја фактора упитника.

**Резултати** Код 148 пацијената без недостајућих одговора (51 мушког и 97 женског пола) узраста  $13,3 \pm 2,00$  година, средња вредност укупног скора *MIQ* упитника је била  $10,14 \pm 7,451$ . Интерна ( $\alpha = 0,913$ ) и екстерна конзистентност ( $\rho = 0,906$ ;  $p = 0,000$ ) показали су високу статистичку значајност. Корелације укупног *MIQ* скора са појединачним скоровима два глобална питања ( $\rho = 0,682$ ;  $p = 0,000$  и  $\rho = 0,366$ ;  $p = 0,000$ , редом), *PAR* скора пре терапије ( $\rho = 0,181$ ;  $p < 0,05$ ) и скора *IOTN* ( $\rho = 0,192$ ;  $p < 0,05$ ) биле су позитивне и статистички значајне. Након експлоративне факторске анализе и паралелне анализе издвојен је један фактор који је објаснио значајан део укупне варијансе.

**Закључак** *MIQ* на српском језику има задовољавајућу интерну и екстерну конзистенцију и валидност и може се примењивати приликом разматрања утицаја малоклузија на квалитет живота код младих особа са ортодонтским неправилностима у Србији.

**Кључне речи:** *MIQ*, упитник о утицају малоклузија; квалитет живота; међукултурално прилагођавање; валидација

## INTRODUCTION

Most patients with malocclusion seek treatment to improve aesthetics, psychosocial relationships, and quality of life (QOL) [1]. However, orthodontic treatment could also improve oral functions [2] and oral health [3]. Demand for orthodontic treatment and treatment outcome satisfaction is not necessarily in correlation with the objective malocclusion records and the clinician's opinion [4]. Moreover, insight into the patients' perception of the malocclusion impact on different aspects of their life might be beneficial in the treatment decision-making process and treatment outcome considerations [5]. Standardized and validated patient questionnaires could be a suitable tool for obtaining such information [6]. A constant increase in the use of the Patients Reported Outcome Measures in orthodontic researches and Patient-centered orthodontic care is seen nowadays, especially in the form of generic and specific health-related QOL questionnaires [7]. Patients seeking orthodontic treatment are mostly young, healthy individuals with malocclusion that are not related to pain or tissue damage. Therefore, generic health and oral health-related QOL measures might not be sensitive enough to record the malocclusion impact on their everyday life or the QOL changes generated during and after orthodontic treatment [8]. Thus, several malocclusion specific QOL questionnaires have been developed and validated by now. The Orthognathic Quality of Life Questionnaire was created for young adult orthognathic patients [9]. It was originally developed in English and have been translated and culturally adapted to other languages including Serbian [10]. On the other side Malocclusion Impact Questionnaire (MIQ) was developed in English to assess young orthodontic patients' concerns regarding the appearance of teeth, social interactions and oral health and functions [11]. The original questionnaire was successfully validated in young persons with malocclusion in the United Kingdom (UK) [12] and New Zealand (NZ) [13]. It has since been cross-culturally adapted and translated into different languages: Chinese [14], Arabic [15], and Spanish [16].

This study aimed to validate the new MIQ in Serbian in the cohort of young Serbian orthodontic patients.

## METHODS

This cross-sectional study was conducted at the university clinic from December 2018 to May 2019. The sample was selected by convenience from new consecutive patients referred to the university clinic. Inclusion criteria were the presence of malocclusion, age 10 to 17, and signed written informed consent. Exclusion criteria were previous orthodontic treatment, the presence of craniofacial syndromes, the presence of cleft lip and palate, and the presence of learning disabilities.

All patients and their parents/guardians were informed orally and were given a written explanation of the research aims and study design. Parents/guardians have signed informed consent for participation in the study. Baseline data that included participants' demographic characteristics, gender, and age, were collected together with the questionnaire. Malocclusion status was assessed on study casts using the Peer Assessment Rating index (PAR index) [17] and the Index Orthodontic Treatment Need - Dental Health Component (IOTN-DHC) [18]. Measuring was done by one orthodontic specialist, previously trained in using PAR and IOTN indices. The MIQ was used to measure the subjective impact of the malocclusion on the participant's QOL. The MIQ consists of 17 items with three-point severity responses (0-2) and two global questions with five-point intensity responses (0-4). Total MIQ score has range 0 to 34, and higher scores represent the poorer QOL related to malocclusion. Two global questions are intended to help in the validation process and are presented separately [12,13].

### **Translation and cross-cultural adaptation**

The original version of the Malocclusion Impact Questionnaire, MIQ handbook, preliminary permission for non-commercial use, and the Users License Agreement (signed and returned) were received from the MIQ corresponding author. A multidisciplinary committee for translation and cross-cultural validation was established to produce the most appropriate semantical and conceptual version of the MIQ in Serbian. Committee members were experts in the English-Serbian-English translation, QOL research, and orthodontics. According to the internationally accepted methodology for the translation and cultural

adaptation of the health-related Quality of life questionnaires the "forward-backward" translation methodology for preparing the MIQ in Serbian was used [19].

A pilot study was conducted on 10 patients in order to check understanding and interpretation of questionnaire in Serbian. Results were discussed between committee members regarding patients' doubts and suggestions. This stage led to the second version of the MIQ in Serbian that was tested on 20 new patients, who filled it out in the presence of researchers who assisted if necessary. Patients were asked additional questions regarding the simplicity, clarity, and relevance of the questions. Once more, the committee members discussed the original MIQ in English and the final version of the MIQ in Serbian, tracked all changes made during the pretesting process, reviewed the introduction and instructions as well as scaling of the responses. The final version of the MIQ in Serbian was printed to be used in the validation process.

### **Validation**

During regular appointments at the university clinic, before the start of the orthodontic treatment, 154 patients with malocclusion who fulfilled the study inclusion criteria were asked to fill out the MIQ in Serbian without any assistance from the doctor or parent/guardian. To assess the patient's acceptance of the MIQ in Serbian, the mean time required for completing the questionnaire and assistance in reading/writing were also noted. Four weeks later, 112 participants were asked to complete the same questionnaire before tooth extractions and the start of any orthodontic treatment, for retest purposes.

### **Statistical analysis**

Descriptive statistics included sample demographics, clinical characteristics, test scores, and questionnaire completion times. Cronbach's alpha-coefficient and Item-total correlation were calculated to assess the internal reliability of the MIQ in Serbian. Spearman's-Brown reliability coefficient was used to evaluate external reliability. Construct and clinical validity

were explored correlating the MIQ in Serbian total scores with two global question scores and PAR index pretreatment scores and IOTN-DHC, respectively, using Spearman's correlation. Explorative Factor Analysis was conducted to assess whether items distribution in the MIQ in Serbian corresponded with the original MIQ items distribution. Parallel analysis, a method for determining the number of factors to retain, was used for final factor extraction.

The study was approved by the Ethics Committee (approval No 36/19).

## RESULTS

The original sample included 154 patients who met the inclusion criteria. However, six participants (3.9%) were excluded due to missing item responses. In the final sample ( $n = 148$ ), 51 (34.5%) participants were male, and 97 (65.5%) female, average age was  $13.3 \pm 2.00$  years (range 10-17 years). All participants were able to read and answer the questions without assistance. Response rates for each item were high (96.7%) with no evidence of significant floor or ceiling effects. Thirteen participants (8.78%) had the total MIQ score of 0 and no one had the maximum (34). No one found MIQ in Serbian items ambiguous or embarrassing. The mean time to complete the MIQ in Serbian was  $4.84 \pm 2.355$  minutes (range 2-12 minutes). Correlation analysis between age and time needed to complete the questionnaire showed significant negative correlation ( $r = -0.751$ ;  $p = 0.000$ ). MIQ in Serbian total scores mean was  $10.14 \pm 7.451$ . The MIQ in Serbian descriptive statistics and frequencies of single item responses as well as descriptive statistics of MIQ in Serbian total score are shown in Table 1. The PAR index mean pretreatment score value ( $n = 129$ ) was  $23.5 \pm 10.73$  (range 1-48). All five IOTN-DHC grades were described in the sample ( $n = 125$ ). Grade 4 was most frequent (40.8%), followed by grade 5 (29.6%), grade 3 (20.0%), grade 2 (8.0%), and grade 1 (1.6%).

## Reliability

Internal reliability analysis using Cronbach's Alpha showed excellent internal consistency of the MIQ in Serbian ( $\alpha = 0.913$ ), indicating that all scale items measured the same concept. If question number 19 would be deleted, Coefficient Alpha would be slightly higher ( $\alpha = 0.920$ , Table 2). Item-total correlation was moderate for fifteen from seventeen questions, while it was poor for questions number 19 and 14 (Table 2).

External reliability evaluated by Spearman's Brown reliability coefficient comparing MIQ in Serbian test and retest total scores ( $n = 110$ ) was excellent ( $\rho = 0.906$ ;  $p = 0.000$ , Table 3).

## Validity

Construct validity was assessed by correlating the first and the second global question single scores and the MIQ in Serbian total scores which showed good correlation. Clinical validity performed by correlating the MIQ in Serbian total score with PAR index pretreatment scores and IOTN-DHC showed weak, but statistically significant correlation. The results of the correlation analysis are shown in Table 3.

Exploratory Factor Analysis was used to explore the allocation of items in the MIQ in Serbian version. The Kaiser-Meyer-Olkin measure ( $KMO = 0.891$ ) and Bartlett's test of sphericity ( $\chi^2 = 1270.84$ ;  $p = 0.000$ ) verified that the sample number and correlation structure were adequate for factor analysis. Three components with an eigenvalue more significant than 1 were extracted explaining the 59.18% of the cumulative variance. All items showed cross-loadings indicating that every item might correspond to all three extracted factors (Table 4). Scree plot indicated that all questions could fit one factor (Figure 1).

According to the Parallel analysis the model justifies only one factor, explaining the 41.65% of the variance. The component matrix showed that sixteen items had factor loading from 0.504 to 0.783. Only item number 19 regarding problems with biting certain foods explained deficient factor loading 0.099 (Table 5).

## DISCUSSION

It has been shown that malocclusions have a significant impact on QOL of orthodontic patients [20]. Specific instruments for health-related QOL have consistently shown to be more sensitive than the generic tools [21]. Common use of a translated and properly validated questionnaire has the advantage of data collection from different cultures that can be compared. Original MIQ in English is a formally validated, self-administered malocclusion disease-specific questionnaire. It was developed in English to measure the malocclusion impact on young people in the UK. The English to Serbian translation and cross-cultural adaptation was done according to the internationally accepted standards [19]. Linguistic structure and the conceptual meaning were prioritized over the word-to-word translation. Appropriate MIQ version suitable for the socio-cultural environment of Serbia was attained through forward-backward translation, expert panel discussions, and pre-testing with cognitive debriefing. MIQ in Serbian was easy to use and 100% of the participants found the questionnaire comprehensible. None of the respondents needed assistance in completing the MIQ in Serbian scale and no question was found embarrassing. Most missing data were recorded as whole-page data and can be considered an accidental omission in completing the questionnaire.

To the best of our knowledge, this is the first report and the first time the MIQ was used in young people with malocclusion in Serbia. The study sample was chosen by convenience, similarly to the original MIQ validation study [12]. Even though clear scientifically sound recommendations for sample size calculation in validation studies are still lacking, the recommended minimum is 100 [22]. Six participants that had missed some of the items in the MIQ in Serbian were excluded from the validation study. The high Kaiser-Meyer-Olkin coefficient showed the sample size of 148 was suitable for performing factor analysis to explore the MIQ in Serbian dimensionality. The sample mean age was similar to the UK study [12]. Gender distribution was similar in both samples [12].

The mean time to complete the questionnaire was acceptable and indicated that the questionnaire was simple and easy to understand. The statistically significant negative correlation between age and time to complete the scale suggested that younger participants needed more time to complete the MIQ compared to the older ones. This finding was in



concordance with Marek Fuchs's conclusion that children and younger adolescents rely more heavily on the information provided in the questionnaire to produce an answer [23].

The MIQ in Serbian mean total score ( $10.14 \pm 7.451$ ) implicates that malocclusion disturbed the QOL of our participants. Malocclusion specific QOL of our patients was better compared to the UK sample ( $11.6 \pm 7.0$ )[12], similar to the Arabic ( $10.10 \pm 7.0$ )[15], and inferior to the NZ ( $7.10 \pm 6.60$ )[13], and Chilean ( $8.30 \pm 6.00$ )[16] samples. Differences in the frequency of responses and the MIQ total scores in different populations can be attributed to the socio-cultural context of the respondents. Also linguistic ambiguities and differences between the survey protocols among studies should not be completely neglected.

The MIQ in Serbian showed excellent internal consistency  $\alpha = 0.913$  ( $\alpha > 0.7$  is recommended), suggesting that the scale was consistent and that all items measured the same concept. Similar results were presented in the UK[12], NZ[13], Arabic[15], and Chilean[16] validation studies. Question number 19 about biting certain foods showed a low item-total correlation. However, given the strong Alpha coefficient and a minimal increase in case of question number 19 omission, removing the item was not considered. External reliability of the MIQ in Serbian was statistically significant and strong. This finding suggests that if the malocclusion does not change, MIQ in Serbian score stays reliable over time.

The validity of health related QOL questionnaires is usually assessed according to how much the information from the questionnaire agrees with the results obtained based on other measurements. Moreover, criterion-validity refers to whether a questionnaire measures what it was intended to measure, and it is known that questionnaire validity could be explored by comparison with previously existing questionnaires intended to measure the same concept. When there is no gold standard in the targeted population, assessing clinical validity could be useful. Thus, we explored the correlation among MIQ total scores and objective clinical measures. MIQ total scores and PAR index pretreatment scores, as well as IOTN-DHC, had statistically significant positive correlation. This indicates that patients with more severe malocclusion and higher treatment need reported poorer malocclusion-related QOL. The moderate to weak correlation was expected according to previous findings. The subjective health related QOL measure do not necessarily correlate with objective findings [4,24]. Also, malocclusion has a more of emotional and social impact compared to the oral symptoms and functional limitations [25].

The MIQ in Serbian construct validity was explored by correlating MIQ total score with global question scores, as suggested in the UK validation study [12]. Statistically significant positive correlations were found, meaning that participants who reported that teeth bothered them and affected their life also appear to have impaired malocclusion QOL. In all reported MIQ validation studies (UK[12], NZ[13], Chinese [14], Arabic[15], and Chilean[16]) this correlation was significant and positive although the strength of correlations differed. It could be assumed that a possible influence of cultural tradition and linguistic specificities in different populations may have a consequential impact when cross-cultural adaptations are performed.

Based on Exploratory Factor Analysis, seventeen items in the scale were divided into three potential factors explaining eigenvalues greater than one. All items corresponded to all displayed factors. This approach could overestimate the number of significant factors. Thus, the Scree Plot and Parallel Analysis as a more rigorous approach to determine the number of factors to retain was performed [26]. The Scree Plot (a graph of the generated eigenvalues) suggested that a model for this study data may have one factor. Moreover, only one produced eigenvalue was higher than random eigenvalues achieved in the Parallel Analysis. These findings suggest that one factor could be retained and that all items in the MIQ scale fit into one dimension, which is in line with the UK validation study results [12].

MIQ in English was successfully adapted for the Serbian population in a cohort of orthodontic patients aged 10 to 17 years. According to the new MIQ in Serbian (MIQ-SR) scores, young people with malocclusion experienced the condition-specific QOL impairment before the orthodontic treatment.

### **Strength of study**

The MIQ in Serbian was filled out by patients without any parent/guardian assistance. All questionnaires were filled out the at the university clinic.

### **Study weakness**

Although all participants were informed that their responses would not affect further orthodontic treatment, subject bias may still be present.

### **Further recommendation**

MIQ-SR longitudinal studies are recommended to determine the responsiveness or ability to detect change over time.

### **CONCLUSION**

Translated and culturally adapted MIQ in Serbian has satisfactory psychometric properties. It is a reliable and valid instrument for the evaluation of dental malocclusion's impact on the quality of life of young people in the Serbian socio-cultural environment. Clinically this condition-specific quality of life instrument might help orthodontic care professionals in the patients' prioritization and treatment options selection.

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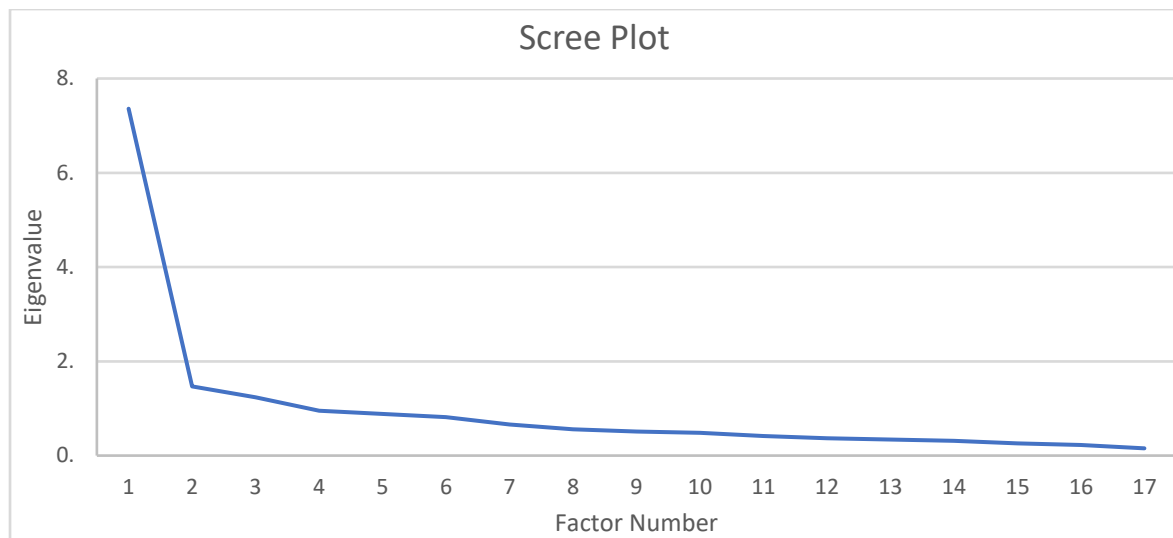
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Paper accepted



**Figure 1.** Scree plot for Malocclusion Impact Questionnaire items

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**Table 1.** Malocclusion Impact Questionnaire in Serbian descriptive statistics and frequencies of single item responses and descriptive statistics of Malocclusion Impact Questionnaire in Serbian total score

Question No	(n = 148)				Frequencies of score				
	Mean	SD	Median	Mode	0 n (%)	1 n (%)	2 n (%)	3 n (%)	4 n (%)
1.	1.29	1.241	1	0	52 (35.1)	38 (25.7)	30 (20.3)	19 (12.8)	9 (6.1)
2.	1.74	1.347	2	1	32 (21.6)	40 (27.0)	33 (22.3)	21 (14.2)	22 (14.9)
3	1.15	0.750	1	1	32 (21.6)	62 (41.9)	54 (36.5)		
4	1.11	0.757	1	1	35 (23.6)	62 (41.9)	51 (34.5)		
5	0.79	0.758	1	0	61 (41.2)	57 (38.5)	30 (20.3)		
6.	0.43	0.630	0	0	95 (64.2)	42 (28.4)	11 (7.4)		
7.	0.51	0.685	0	0	88 (59.5)	44 (29.7)	16 (10.8)		
8.	0.43	0.640	0	0	97 (65.5)	39 (26.4)	12 (8.1)		
9.	0.70	0.744	1	0	70 (47.3)	53 (35.8)	25 (16.9)		
10	0.90	0.735	1	1	48 (32.4)	67 (45.3)	33 (22.3)		
11	0.68	0.712	1	0	69 (46.6)	58 (39.2)	21 (14.2)		
12.	0.90	0.771	1	1	52 (35.1)	59 (39.9)	37 (25.0)		
13	0.45	0.609	0	0	91 (61.5)	48 (32.4)	9 (6.1)		
14	0.55	0.722	0	0	87 (58.8)	41 (27.7)	20 (13.5)		
15.	0.27	0.590	0	0	119 (80.4)	18 (12.2)	11 (7.4)		
16.	0.36	0.596	0	0	103 (69.6)	36 (24.3)	9 (6.1)		
17.	0.24	0.542	0	0	120 (81.1)	20 (13.5)	8 (5.4)		
18.	0.47	0.664	0	0	92 (62.2)	42 (28.4)	14 (9.5)		
19.	0.20	0.507	0	0	125 (84.5)	16 (10.8)	7 (4.8)		
<b>MIQ Total score</b>	<b>10.14</b>	<b>7.451</b>	<b>9</b>	<b>0</b>					

MIQ – Malocclusion Impact Questionnaire; 1. – Bother you; 2. – Affect life; 3. – Happy; 4. – Good looking; 5. – Confident; 6. – Normal; 7. – Sad; 8. – Nervous; 9. – Shy; 10. – Smiling; 11. – Laughing; 12. – Seeing photographs of yourself; 13. – Talking in public; 14. – Other people having nicer teeth than you; 15. – Being bullied; 16. – Making friends; 17. – Fitting in with friends; 18. – Covering teeth with hand when smile; 19. – Biting some foods

**Table 2.** Internal reliability of Malocclusion Impact Questionnaire in Serbian items calculated with Cronbach's alpha-coefficient and Item-total correlation

Question No (n = 148)	Corrected item – total correlation	Cronbach's alpha if item deleted
3. Happy	0.656	0.906
4. Good looking	0.700	0.905
5. Confident	0.613	0.908
6. Normal	0.649	0.907
7. Sad	0.738	0.904
8. Nervous	0.583	0.908
9. Shy	0.665	0.906
10. Smiling	0.673	0.906
11. Laughing	0.627	0.907
12. Seeing photographs of yourself	0.675	0.906
13. Talking in public	0.624	0.907
14. Other people having nicer teeth than you	0.443	0.913
15. Being bullied	0.560	0.909
16. Making friends	0.601	0.908
17. Fitting in with friends	0.558	0.909
18. Covering teeth with hand when smile	0.531	0.910
19. Biting some foods	0.082	<b>0.920</b>



**Table 3.** External reliability, construct and clinical validity of Malocclusion Impact Questionnaire total score in Serbian.

Parameter		External reliability	Construct validity		Clinical validity	
		MIQ Total score (retest) (n = 110)	1. Bother you (n = 148)	2. Affect life (n = 148)	PAR index pretreatment score (n = 129)	IOTN-DHC (n = 125)
MIQ Total score (test)	Spearman's rho	0.906**	0.682**	0.366**	0.181*	0.192*
	Sig. (2-tailed)	0.000	0.000	0.000	0.040	0.032

MIQ - Malocclusion Impact Questionnaire; PAR – peer assessment rating; IOTN-DHC – Index Orthodontic Treatment Need – Dental Health Component;

\*p < 0.05;

\*\*p < 0.01

**Table 4.** Exploratory factor analyses for Malocclusion Impact Questionnaire in Serbian items

Question No (n = 148)	Communalities		Component matrix		
	Initial	Extraction	1	2	3
3. Happy	1.000	0.756	0.701	0.513	0.046
4. Good looking	1.000	0.742	0.744	0.434	0.013
5. Confident	1.000	0.499	0.672	0.208	0.068
6. Normal	1.000	0.629	0.702	0.092	0.358
7. Sad	1.000	0.686	0.783	0.110	0.248
8. Nervous	1.000	0.472	0.644	-0.107	0.215
9. Shy	1.000	0.521	0.713	0.090	-0.062
10. Smiling	1.000	0.753	0.730	0.112	-0.455
11. Laughing	1.000	0.644	0.688	-0.055	-0.410
12. Seeing photographs of yourself	1.000	0.669	0.723	0.230	-0.307
13. Talking in public	1.000	0.537	0.676	-0.278	0.053
14. Other people having nicer teeth than you	1.000	0.282	0.504	-0.164	0.033
15. Being bullied	1.000	0.653	0.627	-0.451	0.239
16. Making friends	1.000	0.543	0.666	-0.313	0.043
17. Fitting in with friends	1.000	0.734	0.627	-0.567	0.135
18. Covering teeth with hand when smile	1.000	0.457	0.595	-0.156	-0.279
19. Biting some foods	1.000	0.483	0.099	0.328	0.604

**Table 5.** Extraction of one factor – parallel analysis for Malocclusion Impact Questionnaire in Serbian items

Question No (n = 148)	Communalities		Component 1
	Initial	Extraction	1
3. Happy	1.000	0.492	0.701
4. Good looking	1.000	0.554	0.744
5. Confident	1.000	0.451	0.672
6. Normal	1.000	0.493	0.702
7. Sad	1.000	0.612	0.783
8. Nervous	1.000	0.414	0.644
9. Shy	1.000	0.509	0.713
10. Smiling	1.000	0.534	0.730
11. Laughing	1.000	0.473	0.688
12. Seeing photographs of yourself	1.000	0.522	0.723
13. Talking in public	1.000	0.457	0.676
14. Other people having nicer teeth than you	1.000	0.254	0.504
15. Being bullied	1.000	0.393	0.627
16. Making friends	1.000	0.443	0.666
17. Fitting in with friends	1.000	0.394	0.627
18. Covering teeth with hand when smile	1.000	0.354	0.595
19. Biting some foods	1.000	0.010	0.099