Psychometric Properties of Croatian and Slovenian Short Form of Oral Health Impact Profile Questionnaires

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Aim To develop Croatian and Slovenian versions of the 14-item Oral Health Impact Profile (OHIP) Questionnaire.

Methods The English original version of the OHIP questionnaire was translated into Croatian (OHIP-CRO14) and Slovenian (OHIP-SVN14) language by a forward-backward translation method. The psychometric properties of the OHIP-CRO14 and OHIP-SVN14 were tested. Concurrent validity was tested on 623 subjects (193 Croatian and 430 Slovenian), test-retest reliability on 115 subjects (55 Croatian and 60 Slovenian), internal consistency on 678 subjects (218 Croatian and 460 Slovenian), and responsiveness on 51 patients (21 Croatian and 30 Slovenian) in demand of treatment (toothache).

Results Concurrent validity was confirmed by the association between the OHIP summary scores and self-reported oral health (correlation coefficients ranged from 0.40 to 0.60, $P<0.001$). Test-retest reliability showed high intraclass correlation (correlation coefficients, 0.79-0.94). Internal consistency showed high Cronbach α (0.77-0.91). Responsiveness was confirmed by a significant difference between the mean OHIP score at baseline and follow-up ($P<0.001$ for both Croatian and Slovenian patients) and high effect size in Croatian and Slovenian patients in demand of treatment (3.00 and 0.57, respectively).

Conclusion Psychometric properties of OHIP-CRO14 and OHIP-SVN14 render these instruments suitable for the assessment of Oral Health Related Quality of Life in Croatia and Slovenia.

Oral Health-related Quality of Life (OHRQoL) indicators are based on a conceptual framework derived from the International Classification of Impairments, Disabilities, and Handicaps (ICIDH) developed by the World Health Organization (WHO) in 1980. The ICIDH model consists of the following key concepts: impairments, functional limitations, pain, disability, and handicap. It provides a theoretical basis for the empirical exploration of the relationships between various dimensions of general and oral health (1). The concept was subsequently introduced in dentistry by Locker (2).

Several instruments have been developed to measure the impact of oral health on the quality of life. Among them, the Oral Health Impact Profile (OHIP) is one of the most sophisticated and most widely used (3).

The original English version of the OHIP-49 consists of 49 items (4). It allows for collection of comprehensive data and evaluation of oral health in a typical population. Respondents are asked how frequently they have experienced a particular problem in the previous month (5,6). Responses are rated on a Likert-type scale (0 – never, 1 – hardly ever, 2 – occasionally, 3 – fairly often, 4 – very often). Zero indicates the absence of problems, whereas higher scores indicate worse oral health. The disadvantages of this long form of the OHIP are the long time required to complete the questionnaire (approximately 10-15 minutes) and high non-response rate to several items in the self-administered questionnaire.

There was an obvious need to create a shorter version of the OHIP-49 instrument by removing some of the items. Therefore, two different 14-item versions (OHIP-14) were developed. The first one was a "regression" short form developed by Slade in 1997 (7), and the other was an "impact" short form developed by Locker and Allen (8). Both versions have recently been translated into other languages (Table 1) and tested for their psychometric properties (9-18).

In addition, other specific versions of the OHIP were developed, such as the OHIP-Edentulous (OHIP-EDENT) for edentulous patients (19); the OHIP version for patients with temporomandibular disorders (20); and the OHIP for dental esthetics for measuring the influence oral esthetics on the quality of life (21).

There has been an increasing need for the use of measures of patients' perceived health in epidemiological, clinical, and longitudinal studies both in Croatia and Slovenia as a complementary outcome to the traditional use of clinical oral disease indicators (22-29). Since no other suitable OHRQoL tools have

Table 1. Short versions of Oral Health Impact Profile (OHIP) in different languages, developed by the end of 2007

Language	Authors	Abbreviated name of translated version	Year of translation	Item numbers from the original OHIP-49
English-original version	Slade GD (7)	OHIP-14	1997	2,6,10,16,20,23,29,32,35,38,42,43,47,48
English-second version	Locker D and Allen PF (8)	OHIP-14	2002	1,7,13,17,19,21,24,28,34,36,40,42,45,47
Finnish	Harju P et al (9)	OHIP-14	2002	2,6,10,16,20,23,29,32,35,38,42,43,47,48
Chinese	Xin WN and Ling JO (10)	OHIP-14	2002	2,6,10,16,20,23,29,32,35,38,42,43,47,48
Sinhalese	Ekanayake L and Perera I (11)	OHIP-14	2003	2,6,10,16,20,23,29,32,35,38,42,43,47,48
Japanese	Ikebe K et al (12)	OHIP-14	2004	2,6,10,16,20,23,29,32,35,38,42,43,47,48
Hebrew	Kushnir D et al (13)	/	2004	2,6,10,16,20,23,29,32,35,38,42,43,47,48
Brazilian / Portuguese	de Oliveira BH and Nadanovsky P (14)	OHIP14	2005	2,6,10,16,20,23,29,32,35,38,42,43,47,48
Malaysian	Saub R et al (15)	S-OHIP(M)	2005	1,5,16,17,28,31,33,37,39,43,45, +3 new items
German	John MT et al (16)	OHIP-G5	2006	1,10,22,26,43
German	John MT et al (16)	OHIP-G21	2006	1,2,3,4,10,11,13,14,15,17,19,22,36,37,38,39,40,42, 43,48,49
German	John MT et al (16)	OHIP-G14a	2006	2,6,10,16,20,23,29,32,35,38,42,43,47,48
German	John MT et al (16)	OHIP-G14b	2006	1,7,13,17,19,21,24,28,34,36,40,42,45,47
Turkish	Mumcu G et al (17)	/	2006	2,6,10,16,20,23,29,32,35,38,42,43,47,48
Swedish	Hagglin C et al (18)	OHIP-14	2007	2,6,10,16,20,23,29,32,35,38,42,43,47,48

been available, international collaboration and a need of cross-culturally compatible instruments required translation of the original OHIP-14 instrument (7) into Croatian and Slovenian.

The aim of this study was to develop Croatian and Slovenian versions of the original English short-form Oral Health Impact Profile (OHIP-14) questionnaire. The OHIP-14 was first translated into two languages and then evaluated for the psychometric properties in the new cultural context and typical populations.

Participants and methods

Participants

The study was approved by the institutional ethics committee in both countries.

The participants were selected from different populations (Table 2). The sampling strategy was similar to that used in the evaluation

of the psychometric properties of the German (5) and Hungarian (6) OHIP versions. Croatian general population sample was selected from among blood donors at the Croatian Institute of Transfusion Medicine in Zagreb in January 2007, whereas Slovenian general population sample was composed of the employees of several educational and research institutions in Ljubljana, namely, Faculty of Medicine, Valentin Vodnik primary school, H. C. Andersen public kindergarten, and Josef Stefan Institute (Table 3). Each participant received a thorough verbal (Croatian) or written (Slovenian) explanation of the study. Only those who provided a verbal informed consent were included. The questionnaires were administered in 2007. The response rate in Croatian and Slovenian population was 91.3% and 90.88%, respectively. Of 166 completed Croatian questionnaires, 3 were excluded from analysis due to missing data. In the Slovenian general population sample, 12

Table 2. Types of population samples, sampling strategies, data collection methods, and tested psychometric properties of Croatian and Slovenian versions of the 14-item Oral Health Impact Profile questionnaire

Sample No.	Sample	Sampling	Data collection	Research purpose
1	general population*	random	questionnaire†	concurrent validity, internal consistency
2	general population‡	random	questionnaire†	concurrent validity, internal consistency
3	prosthodontic patients§	convenience	questionnaire†	concurrent validity, internal consistency, test-retest reliability
4	patients with a treatment demand (toothache)§	consecutive	interview	responsiveness
5	prosthodontic patients‖	consecutive	questionnaire†	concurrent validity, internal consistency, test-retest reliability
6	patients with a treatment demand (toothache)¶	consecutive	interview	responsiveness
7	students§	consecutive	questionnaire†	internal consistency, test-retest reliability
8	students‖	convenience	questionnaire†	internal consistency, test-retest reliability

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†Interviewer-supervised self-administered questionnaire.
‡Employees in educational and research institutions in Ljubljana, Slovenia.
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Table 3. Number, age, and sex of respondents answering Oral Health Impact Profile (OHIP) questionnaire

Sample No.	Sample	n (% of women)	Mean age (standard deviation)	Age range (years)
1	general population*	163 (66.0)	42.7 (17.8)	20-80
2	general population†	400 (67.0)	41.4 (12.7)	19-80
3	prosthodontic patients‡	30 (65.0)	64.5 (12.5)	37-81
4	patients with a treatment demand (toothache)‡	21 (52.0)	51.5 (16.2)	18-70
5	prosthodontic patients§	30 (60.0)	56.4 (12.7)	36-81
6	patients with a treatment demand (toothache)‖	30 (59.0)	39.3 (14.7)	20-72
7	students‡	25 (72.0)	22.2 (1.4)	19-25
8	students§	30 (64.0)	22.6 (1.7)	21-26

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of 400 completed questionnaires were also discarded due to missing data.

The examination of the oral status was performed by a trained dentist in each country according to the WHO criteria before the administration of the questionnaire in the groups of prosthodontic patients and patients requiring treatment (Table 3) (30). The present prosthodontic appliances in the oral cavity were also registered.

Instrument

Derivations of OHIP-CRO14 and OHIP-SVN14. The Slade's version of the OHIP-14 (7) was translated from English into Slovenian and Croatian (web-extra material) according to the accepted standards (31). In each question, subjects were asked how frequently they had experienced a particular problem in the previous month (5,6). Responses were rated on a Likert-type scale (0 – never, 1 – hardly ever, 2 – occasionally, 3 – fairly often, 4 – very often), with zero indicating the absence of problems and higher scores indicating worse oral health. Interviewer-supervised and self-administered questionnaires were collected during 2007. In addition to completing the OHIP questionnaire, the respondents were asked to grade their oral health on a scale from 1 to 4 (1 – poor, 2 – fair, 3 – good, and 4 – excellent).

The English version of the OHIP-14 (4) was translated into both Croatian and Slovenian according to the accepted methods (31). The translation was done jointly by a professional translator familiar with dental vocabulary and a dentist with excellent knowledge of English who had spent at least a year in the USA for educational purposes. The translation was reviewed by two Croatian (Department of Prosthodontic, School of Dental Medicine, University of Zagreb, Croatia) and two Slovenian dentists, with excellent knowledge of English (Department of Dental Pros-

thetics, School of Medicine, University of Ljubljana, Slovenia). The translators and language reviewers worked independently. The final versions of OHIP-CRO14 and OHIP-SVN14 were then back-translated into English by another professional translator also working with a dentist with an excellent knowledge of English who had attended his or her postdoctoral studies in English-speaking countries. Both Croatian and Slovenian back-translations were evaluated by two native speakers of English who compared them with the original English version. Before back-translation, a pilot study was performed in a group of 30 participants for each language to test the clarity of the questions.

The psychometric properties of both Croatian and Slovenian versions of OHIP-14 were then tested for validity, reliability, and responsiveness.

Data analysis

Concurrent validity. Concurrent validity was determined from the association between self-reported oral health and the OHIP summary scores by using the Spearman rank correlation.

Reliability. Two types of reliability were assessed – the test-retest reliability and the internal consistency. The test-retest reliability was assessed by calculating intraclass correlation coefficients (ICC) based on a one-way repeated-measures analysis of variance (ANOVA), using summary OHIP scores from the repeated administration of the tests. This was done according to the Shrout and Fleiss's method (32) for determining the intraclass reliability coefficients as ICC. The same OHIP questionnaire was administered twice within a two-week time-interval. Meanwhile, the respondents were not provided any oral and/or dental treatment. It was predicted that the OHRQoL would not change during the two-week period without any oral treatment. The intraclass correlation coefficients (ICC) were

calculated for all OHIP item scores (33). The internal consistency was assessed by calculating the Cronbach reliability coefficient α (6) and the average inter-item correlation for the OHIP scores.

Responsiveness. Responsiveness of the OHIP-CRO14 and the OHIP-SVN14 was tested on 21 Croatian and 30 Slovenian patients in demand of treatment (Table 2). The respondents were suffering from acute or chronic toothache. They completed the OHIP questionnaires twice, ie, immediately before the treatment and one month after the treatment. It was assumed that the OHRQoL would improve substantially within a one-month period after the treatment, as compared with the status when respondent was in pain. The significance of the difference in the OHIP-CRO14 and OHIP-SVN14 summary scores between the baseline and the follow-up was tested using paired *t* test and calculating two measures of responsiveness – the standardized effect size and the standardized response mean. The standardized effect size was calculated according to Allen et al (33) as follows:

$$\frac{\text{Mean (baseline OHIP score - follow up OHIP score)}}{\text{Standard deviation of baseline OHIP score}}$$

The standardized response mean was calculated as follows:

$$\frac{\text{Mean (baseline OHIP score - follow up OHIP score)}}{\text{Standard deviation}}$$
$$\text{(baseline OHIP score - follow up OHIP score)}$$

Statistical analysis was performed using Statistical Package for the Social Sciences, version 14.0 for Windows (SPSS Inc., Chicago, IL, USA) and Microsoft Office Excel 2003 (Microsoft, Seattle, WA, USA).

Results

Psychometric properties of the new OHIP-CRO14 and OHIP-SVN14 instruments were tested on 239 Croatian and 490 Slovenian respondents, respectively (Table 3).

Table 4. Concurrent validity assessed as the association between self-reported oral health and scores on Croatian and Slovenian versions of the 14-item Oral Health Impact Profile (OHIP-CRO14 and OHIP-SVN14) questionnaires

Self-reported oral health	n	Mean OHIP score	Correlation coefficient
OHIP-CRO14:			
General population (n = 163):			
excellent	94	3.43	0.40*
good	55	7.8	
fair	10	7.9	
poor	4	17	
Prosthodontic patients (n = 30):			
excellent	9	12.33	0.50*
good	20	23.15	
fair	1	44	
poor	0	–	
OHIP-SVN14:			
General population (n = 400):			
excellent	51	1.1	0.55*
good	224	2.98	
fair	94	9.13	
poor	31	17.77	
Prosthodontic patients (n = 30):			
excellent	0	–	0.64*
good	6	6.33	
fair	11	10.45	
poor	13	23.85	

*$P<0.001$.

Concurrent validity

The test was performed on a total of 623 subjects (193 Croatian and 430 Slovenian) from general population and prosthodontic patient samples (Table 3). The validity was verified by a significant association ($P<0.001$) between the self-reported oral health and the OHIP summary scores in all four tested groups of respondents in both the Croatian and Slovenian population (Table 4).

Reliability

The test-retest reliability was evaluated in a total of 115 subjects (55 Croatian and 60 Slovenian) from prosthodontic patient and student samples (Table 3). The 95% confidence intervals for the mean were computed. The mean difference between the scores did not exceed 1.73 points and was not significant (Table 5).

The internal consistency was tested on a total of 678 subjects (218 Croatian and 460 Slovenian) from general population, prosthodontic patient, and student samples (Table 3) using the Cronbach α and the average inter-

Table 5. Test-retest reliability measured by intraclass correlation coefficients (ICC) for Croatian and Slovenian versions of the 14-item Oral Health Impact Profile (OHIP-CRO14 and OHIP-SVN14) questionnaire

Questionnaire	ICC	Mean difference	95% confidence interval	P
OHIP-CRO14:				
students (n = 25)	0.94	-0.72	-1.70-0.22	0.132
prosthodontic patients (n = 30)	0.79	1.73	-1.19-4.66	0.235
OHIP-SVN14:				
students (n = 30)	0.91	0.33	-0.18-0.85	0.194
prosthodontic patients (n = 30)	0.85	1.27	-1.09-3.62	0.280

item correlation for the OHIP-CRO14 and the OHIP-SVN14 item scores. The Cronbach α was satisfactory for both Croatian and Slovenian translation (Table 6).

Responsiveness

Responsiveness of the OHIP-CRO14 and the OHIP-SVN14 was tested on 51 patients (21 Croatian and 30 Slovenian) requiring treatment for a toothache (Table 3). The Croatian group of patients received treatment for dental pulp trepanation with consecutive root canal treatment in 57% of the cases, while tooth extraction was performed in 43% of patients. In the Slovenian group of patients, the treatment was tooth extraction after an unsuccessful endodontic treatment. Mean change score after the treatment was 25.12 (*P*<0.001) for

Table 6. Internal consistency measured by Cronbach α and average inter-item correlation for Croatian and Slovenian versions of the 14-item Oral Health Impact Profile (OHIP-CRO14 and OHIP-SVN14) questionnaire

Questionnaire	n	Cronbach α	Average inter-item correlation
OHIP-CRO14:			
general population (n=163)	163	0.83	0.26
students (n=25)	25	0.78	0.22
prosthodontic patients (n=30)	30	0.90	0.38
OHIP-SVN14:			
general population (n=400)	400	0.91	0.42
students (n=30)	30	0.77	0.20
prosthodontic patients (n=30)	30	0.90	0.39

the OHIP-CRO14 and 4.80 (*P*<0.001) for the OHIP-SVN14 (Table 7).

Discussion

The Croatian and the Slovenian version of the OHIP-14 showed good and sufficiently satisfactory psychometric properties.

The quality of life was established as an important factor in evaluating the impact of a disease and efficacy of different treatments and related factors (22-29). The development of different questionnaires on quality of life led to the construction of the OHIP instrument, the self-administered questionnaire for evaluation of function, symptoms, and social and psychological impact of oral disorders and treatment procedures on general health. Such data can be helpful to dentists in individual treatment planning to improve patient's oral and general health. The OHIP instrument also allows for a comparison between different treatment options and different populations.

Some of the authors of the OHIP-14 translations only translated the original version, while others developed culture-specific versions of the instrument, with a varying number of items (15,16). As developing short versions of questionnaires might not be worthwhile because the results would not be comparable to other populations, it seemed more reasonable to translate the original English OHIP-14 and to include some culture-specific questions in the appendix of the questionnaire, if necessary.

In the English version of OHIP-49 (4), the items had been weighted to reflect the relative importance of each question. Since the weights had not improved the measurement properties (34), they were not obtained in some of

Table 7. Responsiveness of Croatian and Slovenian versions of the 14-item Oral Health Impact Profile (OHIP-CRO14 and OHIP-SVN14) questionnaire tested on two groups of patients with a treatment demand (toothache)

	n	Mean baseline score- mean follow-up score	95% confidence interval	Summary score range at baseline	Standardized effect size according to Cohen	Standardized response mean	P
OHIP-CRO14	21	34.36-9.24	23.00-27.24	17-48	3.00	4.21	<0.001
OHIP-SVN14	30	25.77-20.97	3.17-6.43	15-42	0.57	1.10	<0.001

the recent translations (German and Hungarian versions). Therefore, the weights have not been used in the OHIP-CRO14 and OHIP-SVN14 versions.

The results of the OHIP-CRO14 and the OHIP-SVN14 were compared with the test measuring similar clinical properties. The strong correlation between self-rated oral health and hypothesized effect on the OHRQoL and the OHIP-14 scores confirmed strong concurrent validity in the tested groups. In fact, similar coefficients of correlation and levels of statistical significance were observed in both the Croatian and the Slovenian short forms.

Better scores of the self-reported oral health in the Croatian prosthodontic group (sample 3) in comparison with the Slovenian prosthodontic group could be explained by the higher mean age of the Croatian respondents and higher percentage of removable denture wearers in the Croatian group. In fact, the Croatian prosthodontic group consisted only of removable denture wearers, whereas the Slovenian group had only 24% of removable denture wearers. Although oral health measured by one simple question about self-reported oral health was found to be satisfactory in the Croatian group, more particular questions referring to the individual oral conditions revealed the impact of oral problems on different aspects of daily life. This also proves that the fourteen targeted questions of the OHIP instrument are superior to the one general question considering the patient's self-reported oral health. Although removable denture wearers were probably generally satisfied with their removable dentures, they could still have problems related to removable dentures wearing like sore spots, difficulty to chew some types of food, and problems with denture stability and retention.

The four primary methods of assessing reliability of a questionnaire involve determining the extent to which the test produces consistent results on retesting (test-retest); the relative accuracy of a test at a given time (alternate forms); the internal consistency of the items (split half); and the degree of agreement between two examiners (inter-scorer agreement) (35). The purpose of the reliability is to estimate the degree of test variance caused by error. The internal consistency examines whether several items that measure the same general construct produce similar scores. This study tested the reliability of the questionnaires using the Cronbach α and the test-retest approach. The test-retest reliability was satisfactory and the mean difference was not significant for both the Croatian and the Slovenian version.

The Cronbach α is a summary statistics, which captures the extent of agreement between all possible subsets of questions. The Cronbach α values >0.80 indicate a reliable scale, although at the initial stages of the study, values >0.70 are also acceptable (36). In this study, the Cronbach α showed satisfactory values. Average inter-item correlation confirmed satisfactory reliability of both OHIP questionnaires. The results of the present study revealed that the reliability of both the OHIP-CRO14 and the OHIP-SVN14 questionnaire was very similar to the original English short version (7).

Responsiveness measures the response between two administrations of the same test, for example, a change caused by a treatment procedure. We supposed that one-month period after the treatment would be optimal for a total recovery of all symptoms of dental pain. In the German and the Hungarian versions, the recommended recall period was also one month (5,6). Our results confirmed the satisfactory responsiveness to appropriate treatment in both the Croatian and Slovenian respondents.

According to Cohen, the effect size of 0.20 is considered small, 0.50 moderate, and 0.80

large (37). The effect size was satisfactory for both Croatian and Slovenian versions. The standardized effect size and the standardized response mean were higher in the Croatian than in the Slovenian group of respondents. This was attributed to the difference in selecting respondents with dental pain. In the Slovenian respondents with toothache, chronic pain persisted after the unsuccessful endodontic treatment, while in the Croatian group the majority of the patients with toothache had acute dental pain.

In the assessment of psychometric properties, we used the same study protocol as did Germans and Hungarians (6,16). Moreover, the study assessed the validity of the OHIP-CRO14 and OHIP-SVN14 questionnaires only by using self-reported measures, while the validity assessment could be performed by using both clinical and patient-reported variables. This may be considered as a limitation of the study. The validity of these instruments will be tested using clinical assessment of oral conditions in the future. Nevertheless, to the best of our knowledge, the OHIP questionnaire has not yet been translated into any Slavic language and its psychometric properties have not been examined in this cultural environment.

In conclusion, this study confirmed that OHIP-CRO14 and the OHIP-SVN14 questionnaires are suitable for the assessment of the OHRQoL in longitudinal, cross-sectional, and cross-cultural clinical studies.

Acknowledgments

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