

# The Japanese version of the Oral Health Impact Profile (OHIP) – validation among young and middle-aged adults

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**Objective** To validate the Japanese version of the Oral Health Impact Profile (OHIP-J) for use among young and middle-aged adults. Evaluating the criterion validity was particularly important in this study. **Method** The original Oral Health Impact Profile (OHIP) was translated into Japanese. Data from 6,079 subjects aged 20-59 were collected by means of a self-administered questionnaire and the oral condition records of a sample of workers. The survey involved items for the OHIP-J and self-rated oral health, denture wearing, number of missing teeth, work type, occupational rank, gender, and age. We adopted a self-rated oral health and number of missing teeth as validity criteria for this analysis. **Results** Using multiple linear regression analysis, the adjusted total OHIP-J scores for respondents who rated their oral health as poor were higher than those who did not (46.6 vs. 27.6;  $p < 0.001$ ). The variable of missing teeth was significantly associated with the OHIP-J total and subscale scores independent of gender, age and denture wearing ( $p < 0.001$ ). **Conclusions** These findings suggest that the OHIP-J is suitable for assessing the oral health-related quality of life of young and middle-aged adults in Japan.

*Key words:* oral health; quality of life; questionnaire; validity

## Introduction

Oral health-related quality of life (OHQOL) has been an area of growing research interest in dentistry in recent years. Assessment of the OHQOL of patients and populations provides an opportunity to better understand the burden imposed by oral disorders and is more useful than the traditional clinical indicators of disease alone (Gift and Atchison, 1995). A key issue in research using patient-based measures of OHQOL is which measure to select from among the many subjective oral health indicators that have been developed to date.

We selected the Oral Health Impact Profile (OHIP) as an appropriate measure for studying the OHQOL in a Japanese population for the following reasons. First, because of the structural intensity based on Locker's adaptation of the WHO's International Classification of Impairments, Disabilities and Handicaps (ICIDH) model of health for oral health (Locker, 1988), the OHIP enables researchers to capture the multi-dimensionality inherent in the concept of OHQOL. The OHIP consists of 49 items, grouped into seven subscales: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap (Slade and Spencer, 1994). These subscales are hierarchically ordered, ranging from primary symptoms at one end, to handicaps affecting a broad range of social roles at the other. Second, the OHIP was translated into several languages and its reliability and validity have already been verified in several countries with different cultural backgrounds (Allison *et al.*, 1999; John *et al.*, 2002; Slade, 1997; Wong *et al.*, 2002).

Currently, the OHIP has been utilized primarily in studies involving elderly patients and populations. From a social perspective, such studies should also be undertaken in adult populations of working age. A number of studies have reported substantial population-level effects of oral conditions with respect to lost hours of work (Reisine and Miller, 1985; Reisine, 1985). Young and middle-aged adults have been shown to miss more hours of work on account of dental visits and oral problems than older adults (Gift *et al.*, 1992). Consequently, studies which are limited to individuals no longer in the labor force are likely to underestimate the societal burden of oral disorders.

A Japanese national survey has reported that the mean number of missing teeth increase with age (Health Policy Bureau, 2001). However, the OHQOL in the Japanese population has not been investigated. In addition, the impact of aging on the OHQOL in working age individuals has not been quantified with a subjective measurement, even though the deterioration of oral health with aging is widely recognized. The purpose of this study was to validate the Japanese language version of the OHIP (OHIP-J) for use among young and middle-aged adults. The criterion validity, including the concurrent and discriminant validity, was given particular consideration in this study.

## Methods

### *Survey*

A questionnaire survey using the OHIP-J was conducted as part of a worksite oral health promotion programme, which included a face-to-face oral health instruction and correspondence instruction to enhance their oral health behavior. The main purpose of collecting the data was to ascertain oral status for planning the health promotion programme. The workers surveyed were responsible for administering various social welfare programmes including health insurance and welfare pensions, in accordance with Japanese government regulations. They worked at scattered offices in one region located in southwestern Japan. From 2000 through 2001, the self-administered questionnaire was distributed to all the workers and collected by the manager of each section in the workplace. Staff of the organization and the authors explained the purpose of the survey to representatives from each workplace. Every participant was notified of the survey via a representative. Of the 10,202 questionnaires distributed, 9,114 (89.3%) were completed. Subsequently, the subjects received a dental health checkup of their oral condition, when a face-to-face oral health instruction was conducted.

The purpose and methodology of this study were approved by the Ethical Committee of University of Occupational and Environmental Health, Japan.

### *The Japanese language version of the OHIP (OHIP-J)*

The translation process involved the forward translation of the OHIP from English into Japanese. Two medical doctors, fluent in both Japanese and English and with extensive experience in developing health questionnaires, revised the translation. A panel of ten dental hygienists and company employees completed a copy of the translated questionnaire in order to identify any errors or potential language difficulties. The panel included equal numbers of men and women, and a balance of younger and older members. The final version of the OHIP-J was produced, incorporating the comments and suggestions of this panel. The final OHIP-J reflected some modifications to the standard OHIP. The first sentence of the questionnaire asked: "Over the past one year, how often have you experienced the following conditions because of your oral problem (teeth, gum, dentures and jaw)?" Each item was then written in the form of a statement (e.g., "I have had difficulty chewing some foods because of problems with my teeth, mouth, or dentures"). One of the OHIP-49 items (Q41, "Have you had trouble getting on with other people because of problems with your teeth, mouth, or dentures?") could not be adequately translated. Consequently, this item was excluded from the OHIP-J. The response format was the same as in the original English-language version of the OHIP. A Likert-type scale was used with the following options: 'very often' (code 4), 'fairly often' (code 3), 'occasionally' (code 2), 'hardly ever' (code 1), and 'never' (code 0). For the three items that asked about denture-related problems, a 'does not apply' response option was provided for those who did not wear dentures.

The reliability and validity of the original version of

the OHIP has been reported previously (Slade, 1997; Slade and Spencer, 1994). The assessment of the reliability of the OHIP-J has also previously been reported (Ide *et al.*, 2002). Briefly, the one-month test-retest reliability was evaluated using samples from 30 participants from one workplace, aged between 26 and 66 years. The  $\kappa$ -value for each item was shown to be relatively stable (28 items > 0.4). The intra class correlation coefficients were as follows: functional limitation, 0.81; physical pain, 0.80; psychological discomfort, 0.77; physical disability, 0.62; psychological disability, 0.75; social disability, 0.62; handicap, 0.72. They demonstrated good reproducibility. From the total sample, 7,277 surveys completed at the end of 2000 were used to generate Cronbach alpha coefficients to assess internal reliability. The coefficients ranged from 0.83 to 0.94 for the seven subscales. These results indicate that the OHIP-J is a reliable measure.

### *Other measures*

Other items included in the questionnaire were self-rated oral health (excellent, good, fair, poor); denture wearing (yes/no), work type (office personnel/others), occupational rank (administrator/others), gender and age. The status of the subjects' oral condition was recorded based on number of missing teeth except third molar and denture wearing.

### *Analysis*

From a total of 9,114 completed surveys, responses from those aged <20 years (n=17) and those aged >59 years (n=307) were excluded. If more than 10 responses were left blank, the questionnaire was also discarded (n=132). Of the remaining 8,658, data from the 6,079 subjects that completed a dental checkup were used in the present analysis. Because there were few people that wore dentures in the 20-39 age bracket, we excluded three of the OHIP-J items referring to denture-related disorders as these do not apply to those without dentures. One item (Q41) had previously been deleted during development of the OHIP-J. Responses on the remaining 45 items of the OHIP-J were therefore analyzed.

The OHIP-J subscale scores were estimated by summing the scores of the responses (ranging from 0 to 4) for individual items corresponding to each subscale: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. The total OHIP-J score reflected the responses to these 45 items. Missing responses to individual items were replaced with the sample mean of the coded responses for that item. The frequency of blank items ranged from 0.0% (Q34) to 1.1% (Q15) in this study.

The mean of the total OHIP-J score and seven subscale scores were calculated according to gender, age group, denture wearing, self-rated oral health, missing teeth, work type and occupational rank. Two types of analyses were performed to assess the criterion validity. To assess the concurrent validity of the OHIP-J, the criterion was self-rated oral health dichotomized into positive and negative. The total OHIP-J scores were calculated using multiple linear regression analysis, adjusted for gender (male/female) and age group (20-29 yrs, 30-39 yrs, 40-49

ys and 50-59 yrs). To assess the discriminant validity, we investigated the association between these scores and the number of missing teeth using multiple linear regression analysis, while gender (male/female), age (years) and denture wearing (yes/no) were also added to the model. Statistical significance was reported when the p-value was less than 0.001. All analyses were performed using the Statistical Analysis System (SAS) for Windows version 8.0. Multiple linear regression analysis was carried out using the PROC GLM and PROC REG procedures (Ronald P. Cody, 1987; SAS Institute Inc., 1995).

## Results

The mean total and subscale OHIP-J scores by each demographic and oral health variables are presented in Table 1. There was little difference observed in relation to gender. As expected, data showed a general trend towards a higher mean total and subscale OHIP-J scores with increasing age and number of missing teeth. These scores were higher in denture wearing subjects than those without dentures. Subjects who rated their oral health as poor had similarly higher scores than those who rated

**Table 1.** Mean total and subscale OHIP-J scores by demographic and oral health variables

		<i>Subscale</i>								
		<i>Total</i>	<i>Func- tional limitation</i>	<i>Physical pain</i>	<i>Psycho- logical discomfort</i>	<i>Physical disability</i>	<i>Psycho- logical disability</i>	<i>Social disability</i>	<i>Handicap</i>	
		Range:								
		0-180	0-32	0-32	0-20	0-32	0-24	0-16	0-24	
All	6,079	36.9	9.3	9.2	5.0	4.5	4.2	1.8	3.1	
<i>Gender</i>										
male	4,576 (75.3)	36.3	9.1	9.2	4.6	4.5	4.1	1.8	3.0	
female	1,503 (24.7)	38.7	9.8	9.0	6.1	4.5	4.5	1.7	3.2	
<i>Age group(years)</i>										
20-29	1,272 (20.9)	28.9	7.5	8.2	4.2	2.8	3.2	1.1	2.0	
30-39	1,358 (22.3)	34.1	8.8	8.8	4.8	3.7	3.8	1.6	2.8	
40-49	1,921 (31.6)	39.6	9.9	9.5	5.2	5.1	4.5	2.0	3.5	
50-59	1,528 (25.1)	42.7	10.4	9.9	5.6	6.0	5.0	2.1	3.7	
<i>Denture wearing</i>										
Yes	427 (7.0)	56.3	13.3	11.4	7.4	9.0	6.9	3.0	5.3	
No	5,652 (93.0)	35.4	9.0	9.0	4.8	4.2	4.0	1.7	2.9	
<i>Self-rated oral health</i>										
Excellent	192 (3.2)	12.1	3.5	3.6	1.4	1.3	1.1	0.5	0.8	
Good	2,899 (47.7)	28.1	7.2	7.4	3.7	3.3	3.0	1.3	2.3	
Fair	2,390 (39.3)	44.2	11.0	10.8	6.1	5.4	5.1	2.1	3.7	
Poor	489 (8.0)	62.7	15.2	13.9	9.1	8.3	7.8	3.0	5.4	
Unknown	109 (1.8)	39.1	9.6	9.5	5.3	5.2	4.3	1.8	3.3	
<i>Missing teeth</i>										
0	2,977 (49.0)	30.5	7.9	8.2	4.2	3.2	3.3	1.3	2.3	
1-4	2,369 (39.0)	39.4	9.8	9.7	5.3	4.8	4.5	1.9	3.4	
5-28	733 (12.1)	54.9	13.2	11.3	7.4	8.4	6.5	2.9	5.1	
<i>Work type</i>										
Office - personnel	4,181 (68.8)	36.8	9.3	9.2	5.0	4.4	4.1	1.7	3.0	
Others	1,793 (29.5)	37.2	9.3	9.1	5.1	4.6	4.3	1.8	3.1	
Unknown	105 (1.7)	35.5	8.7	8.9	4.3	4.5	4.0	1.9	3.1	
<i>Occupational rank</i>										
Administrator	2,063 (33.9)	41.0	10.2	9.8	5.3	5.4	4.6	2.1	3.6	
Others	3,895 (64.1)	34.7	8.8	8.8	4.8	4.0	3.9	1.6	2.8	
Unknown	121 (2.0)	38.5	9.3	9.5	4.7	5.1	4.4	2.1	3.4	

it good. Administrators had higher mean total scores than others.

The adjusted means of total OHIP-J score in relation to self-rated oral health according to gender and age group are presented in Figure 1. The adjusted means of total OHIP-J score for respondents who rated their oral health as poor were higher than for those who did not. The adjusted total OHIP-J scores were 31.4, 34.8, 40.0, 42.3 for 20-29 years, 30-39 years, 40-49 years, and 50-59 years, respectively ( $p < 0.001$ ). Gender had a significant effect, but the difference in the score was small (male, 36.1; female, 38.2,  $p < 0.001$ ). Respondents who rated their oral health as poor had a higher adjusted mean of score

than those who did not (46.6 vs. 27.6;  $p < 0.001$ ). The adjusted means of each subscale OHIP-J had a similar tendency in that the total scores for respondents who rated their oral health as poor were higher than those who did not (data not shown).

The relationship between the total and subscale scores and factors related to OHQOL is illustrated in Table 2. Number of missing teeth had the highest standardized partial regression coefficients in all models ( $p < 0.001$ ). Standardized partial regression coefficients for missing teeth were higher for functional limitation, psychological discomfort and physical disability subscales compared with those for other subscales.

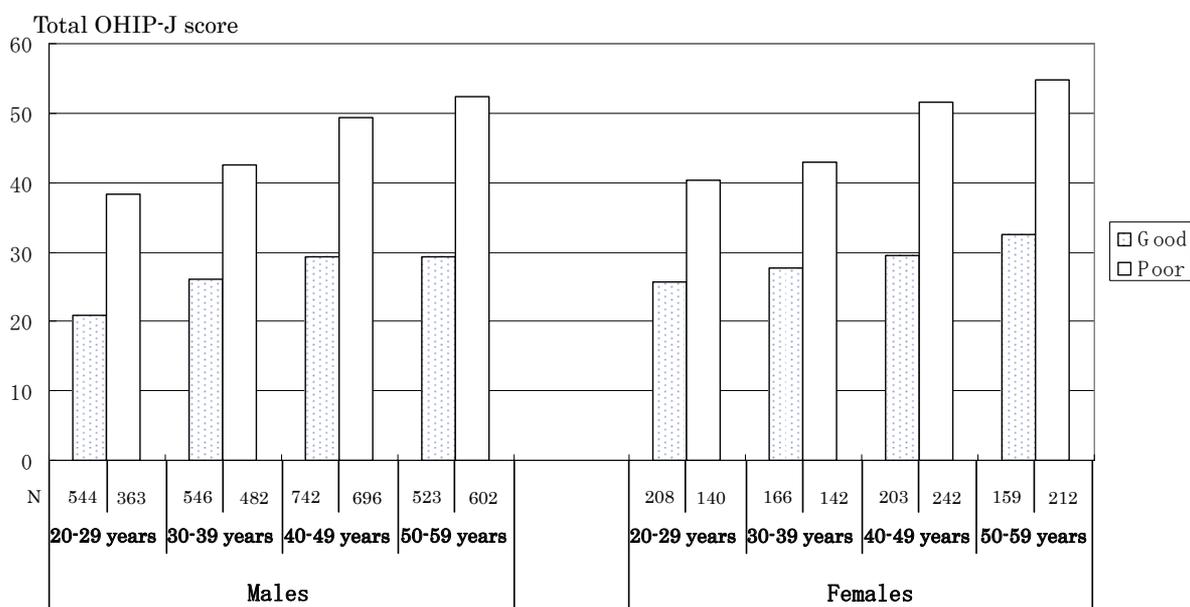


Figure 1. Total OHIP-J score in relation to self-rated oral health according to gender and age-group

Table 2. Multiple linear regression results of the association between OHIP-J and the number of missing teeth

Independent variables	Dependent variables							
	Total	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
	SRC <sup>a</sup> p	SRC <sup>a</sup> p	SRC <sup>a</sup> p	SRC <sup>a</sup> p	SRC <sup>a</sup> p	SRC <sup>a</sup> p	SRC <sup>a</sup> p	SRC <sup>a</sup> p
No. of missing teeth	0.247 <0.001	0.248 <0.001	0.154 <0.001	0.239 <0.001	0.257 <0.001	0.199 <0.001	0.158 <0.001	0.184 <0.001
Gender (Female=1/Male=0)	0.034 0.005	0.043 <0.001	-0.020 0.120	0.155 <0.001	-0.007 0.554	0.034 0.006	-0.024 0.050	0.007 0.558
Age(yrs)	0.114 <0.001	0.100 <0.001	0.076 <0.001	0.039 0.003	0.157 <0.001	0.082 <0.001	0.122 <0.001	0.116 <0.001
Denture wearing (Yes=1/No=0)	0.041 0.009	0.024 0.129	0.015 0.361	0.011 0.485	0.073 <0.001	0.047 0.003	0.031 0.053	0.045 0.004
	R <sup>2</sup> =0.116	R <sup>2</sup> =0.103	R <sup>2</sup> =0.043	R <sup>2</sup> =0.097	R <sup>2</sup> =0.158	R <sup>2</sup> =0.077	R <sup>2</sup> =0.065	R <sup>2</sup> =0.080

<sup>a</sup> Standardized partial regression coefficient

## Discussion

We found that the OHIP-J was a valid instrument for evaluating OHQOL among young and middle-aged adults in Japan. The total OHIP-J scores for respondents who rated their oral health as poor were higher than for those who did not in all gender and age groups. Furthermore, an increasing number of missing teeth was associated with poor OHQOL, even when adjusted for age.

To test the accuracy of the complete measure, the criterion validity (concurrent and discriminant validity) is used to evaluate if the instrument and “gold standard” measures are highly correlated for the same theme (Ian McDowell, 1996). In this study, concurrent validity indicated by comparing the OHIP-J scores with self-rated oral health were obtained by applying the measurement at the same time. The association observed between self-rated oral health and the OHIP-J scores was consistent with the predicted direction. The scores increased as the subject’s self-rated oral health changed from excellent to poor (Table 1). This was consistent after being adjusted for age and gender (Figure 1). In addition, we investigated the difference in the discriminant validity of OHIP-J in relation to the number of missing teeth. The significant association between OHIP-J scores and number of missing teeth was shown. This indicated that an increasing number of missing teeth correlated with poor OHQOL. The number of remaining natural teeth played a central role as a determinant of subjective oral health in the UK and Australia national samples (Steele *et al.*, 2004). Furthermore, a comparison of standardized partial regression coefficients led to expected findings. For example, “functional limitation” and “physical disability” subscale had higher standardized partial regression coefficients than those of other subscales. It is well known that the normal oral functions - chewing, speaking, laughing and appearance - can be impaired by loss of natural teeth (Elias and Sheiham, 1998). These above-mentioned findings suggested that the OHIP-J validity was accurate.

It has been expected that the cross-cultural comparisons of oral health states and outcomes is undertaken using the OHIP. Guidelines to preserve equivalence in cross-cultural adaptations of health-related quality of life assessment tools include the use of forward- and back-translation, committee review, pre-testing, and weighting of scores (Guillemin *et al.*, 1993). Cross-cultural consistency of the OHIP was verified between French- and English-speaking peoples using the Thurstone method of paired comparison (Allison *et al.*, 1999). In our study, the translation process did not strictly adhere to these recommended guidelines and one item was excluded in the translation process. In this respect, the OHIP-J had limitations for the use for cross-cultural research. Cultural background is very different between Western and Oriental countries. This would cause difficulties in translating the original OHIP to the Japanese version. For example, we supposed that verbal equivalence compensated for the loss of intuitive comprehension. In the Chinese version of the OHIP (Wong *et al.*, 2002), the rephrasing of some questions was considered necessary to make the translation culturally relevant to study subjects. Cross-cultural comparison of OHQOL may require further

improvements of the OHIP-J, especially for emotional and social dimensions.

However, we believe that the OHIP-J is a valid measure for cross-national research. We reported that the OHIP-J had good reliability and had few items left blank (Ide *et al.*, 2002). In the present study, the total/subscales OHIP-J scores were significantly associated with self-rated oral health and number of missing teeth, supporting reasonable criterion validity of the OHIP-J. In addition, by converting each subscale’s mean to a 0-to-100 scale (data not shown), the means of subscales scores of “functional limitation”, “physical pain” and “psychological discomfort” were higher than those of other subscales. This suggested that the hierarchical ordering of subscales within the OHIP was kept in the OHIP-J. The OHIP-J thus appears an appropriate measure for assessing the OHQOL in young and middle-aged Japanese adults.

In general, it is considered that socio-economic status, including education, income and social class, are key domains to interpret OHQOL. However, in this study, there was a little difference in OHIP-J scores according to work related factors. In Japan, every resident is enrolled in some form of health insurance plan. Most dental care costs are covered by health insurance which was strictly standardized nationwide by the government, except for the cost of orthodontic treatment and part of the cost of any prosthetic appliance. We supposed that social homogeneity of this study’s subjects was the justification for the above results.

A number of quality of life measures now exist in the field of dentistry, which were originally developed for use with an elderly population. The OHIP has been widely used, but predominantly with people over 60 years of age. There is little information concerning OHQOL in the working age population. The OHIP-J was found to be suitable for a younger adult population in this study and this wider application has provided new data on OHQOL, with a strong association between increasing the number of missing teeth and the OHQOL seen. Use of the OHIP has an important role in fostering patient-assessed measures of health outcomes. Further work is necessary to assess the influence of oral conditions and social factors on variations in the perception of health states in young and middle-aged adults, in particular.

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