

Application of the Oral Health Impact Profile (OHIP) among Taiwanese elderly

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Abstract

Purpose To validate the Chinese (Taiwan) version of the Oral Health Impact Profile (OHIP-49T) and develop a short form of the OHIP (OHIP-14T) for the elderly.

Methods A total of 1402 subjects, aged 65 and above, received a personal interview and oral examination. Internal consistency, measured by Cronbach's alpha, and test-retest reliability were assessed by intra-class correlation coefficient (ICC) during a 2-week interval. The criterion-related validity of OHIP-49T was evaluated through associations between the OHIP-49 score with prosthetic need and prosthetic status. A subset (OHIP-14T) questionnaire, derived through a controlled regression procedure, was compared with the original OHIP-14 by Slade (OHIP-14S).

Results The Cronbach's alpha and ICC values were 0.97 and 0.98 for OHIP-49T and 0.90 and 0.93 for OHIP-14T. Mean scores of the OHIP-49T were significantly associated with prosthetic status ($P = 0.0013$) and prosthetic need ($P = 0.0004$), which were examined by dentists. The

OHIP-14T score had stronger discriminatory ability than OHIP-14S.

Conclusions The OHIP-49T showed satisfactory reliability and validity for this Taiwanese elderly population. The OHIP-14T is more effective to measure OHRQoL than OHIP-14S.

Keywords Quality of life · OHIP · Reliability · Validity · Elderly

Abbreviations

OHRQoL	Oral-health-related quality of life
OHIP	Oral Health Impact Profile
OHIP-49T	Taiwanese version of the Oral Health Impact Profile
OHIP-14T	Taiwanese version of short-form Oral Health Impact Profile
OHIP-14S	Original English version of short-form Oral Health Impact Profile developed by Slade
OHIP-49C	Chinese (Hong Kong) version of the Oral Health Impact Profile
OHIP-14C	Chinese (Hong Kong) version of short-form Oral Health Impact Profile
OHIP-14J	Japanese version of short-form Oral Health Impact Profile
OHIP-14K	Korean version of short-form Oral Health Impact Profile
ICC	Intra-class correlation coefficient
SF-36	36-item short-form health survey
WHOQOL-BREF	World Health Organization Quality of Life Scale-Brief
EORTC	European Organization for Research and Treatment of Cancer

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Introduction

The concept of oral-health-related quality of life (OHRQoL) has been increasingly emphasized in dental treatment [1]. In 1988, Locker [2] proposed a conceptual model of OHRQoL by which oral impairment or disease may lead to functional limitations, and hence physical pain and psychological discomfort. The consequent disability (physical, psychological, or social) can lead to handicap. The most commonly used OHRQoL questionnaire, Oral Health Impact Profile (OHIP) [3], adopted the model and constituted a set of 49 items (OHIP-49) as a comprehensive measure of seven dimensions (functional limitation, physical and psychological discomfort, physical, psychological and social disability, and handicap).

Health-related quality of life measures must respect local social and cultural backgrounds. Therefore, the OHIP-49 has been translated and validated in several countries [4–11]. A Chinese version of the OHIP was developed by Wong and McMillan [4] for the Hong Kong elderly. Since Cantonese is the Hong Kong dialect, different from the Mandarin used in Taiwan and most of China, it was necessary to translate and validate the OHIP-49 into Mandarin in a linguistically and culturally appropriate manner for elderly Taiwanese.

The OHIP, a 49-item questionnaire, can be time-consuming during interview. An abbreviated version of the OHIP, developed by Slade, comprises 14 items (OHIP-14S) [12]. Locker and Allen [13] suggest that different short forms may be needed, depending on investigation purpose and applied population. Recently, translated versions of the original OHIP-14S have been developed [14–18], as have different types of short-form OHIPs for various populations or purposes [4, 19–22].

Although the SF-36 [23] and WHOQOL-BREF [24] for assessing health-related quality of life, and the EORTC for cancer patients, have been translated and validated for use in Taiwan [25–27], a recent study reported that OHIP-49 serves better to measure the OHRQoL than the SF-36 [28]. Therefore, a validated OHRQoL instrument is crucial for Taiwanese elderly. This study's purpose was to formally translate and validate the Chinese (Taiwan) version OHIP-49 in terms of test–retest reliability, internal consistency, and criterion-related validity and to develop a short-form OHIP (OHIP-14T) for use among Taiwan's elderly.

Materials and methods

Subjects and study design

A community survey was designed to recruit institutionalized and non-institutionalized Taiwanese residents aged 65 years and above. The territory of Taiwan was divided

into four geographical areas (north, central, south, and east). Counties within each area were dichotomized into urban or rural counties [29], excluding the entire east area, considered rural. Based on a previous survey, indicating 13% edentulous rate among the elderly [30], a 200-participant sample from each region was required for precision to reach within 5%. Within each region, 2–3 elderly institutes were selected in representative geographical locations and participants were recruited until a count of 100. Non-institutional participants were recruited from local residents visiting health centers for free general health screenings. Participants received dental examination and completed a questionnaire with a trained interviewer. Written informed consent was obtained from all participants. This study was approved by the Human Experiment and Ethics Committee, Kaohsiung Medical University Hospital (KMUH-IRB-980033).

Clinical data collection

Participating dentists were trained by a prosthodontist. WHO guidelines [31] for the assessment of prosthetic need and prosthetic status were followed. Categories in prosthetic need included: (1) no need, (2) need for fixed prosthesis, (3) need for partially removable prosthesis or for a combination of fixed and/or partially removable prostheses, and (4) need for fully removable prosthesis (replacement of all teeth). Prosthetic status included: (1) no prosthesis, (2) fixed prosthesis, (3) partially removable prosthesis or both fixed and partially removable prosthesis, and (4) fully removable prosthesis.

OHIP translation

The original OHIP questions [3] were first translated into traditional Chinese. A bilingual dentist, without knowing the original OHIP, performed a backward translation, providing feedback on translation content and semantics. The back-translation and the original OHIP version differed in the description of “pain”. Words were selected to match local colloquialisms.

Questionnaire

Questionnaires included demographic information and the translated Oral Health Impact Profile (OHIP-49T). OHIP question responses used a 5-point Likert scale, indicating a problem's frequency: “very often” (score = 4), “often,” (score = 3) “occasionally,” (score = 2) “rarely,” (score = 1) or “never” (score = 0) during the last 12 months. The total OHIP-49T score was a summation of 49 individual item scores, and the seven dimension scores were summations within each

dimension. Lower OHIP scores indicated better oral-health-related quality of life.

Development of OHIP-14T

A new short-form OHIP (OHIP-14T) was developed through a controlled regression procedure [12], where individual items were selected sequentially based on the largest contribution to R^2 with maximally two items per dimension.

Reliability and validity of the OHIP-49T and OHIP-14T

A 2-week test–retest reliability interval was assessed by intra-class correlation coefficients (ICC) from 60 participants. Internal consistency was assessed by Cronbach's alpha. Criterion-related validities of the OHIP-49T, OHIP-14T, and OHIP-14S [12] were further evaluated by assessing associations with prosthetic need and prosthetic status while adjusting for covariates (gender, age groups, education, dwelling status) by multivariable analyses. The statistical analyses used SAS[®] 9.1.3 (SAS Institute Inc., Cary, NC, USA).

Results

Table 1 shows basic demographic characteristics. Of the participants, 56.56% of participants were women, 43.44% were men, and 54.28% were over age 75. Dental examinations indicated that 20.68% of participants lacked prosthesis and 32.81% needed no prostheses. Cronbach's alpha ranged from 0.81 to 0.97 for the seven dimensions and was 0.97 for OHIP-49. Test–retest reliability ICC for the seven dimensions ranged from 0.86 to 0.97 and was 0.98 for OHIP-49 (Table 2).

Table 1 Demographic background and oral conditions of all subjects

Variables	All subjects ($n = 1402$)	
	n	%
Gender		
Male	609	43.44
Female	793	56.56
Age group		
65–74 years	641	45.72
75+ years	761	54.28
Education		
Illiterate	559	40.19
Elementary school	469	33.72
Junior high school	121	8.70
Senior high school	242	17.40
Dwelling status		
Community-dwelling status	683	48.72
Institution-dwelling status	719	51.28
Prosthetic need		
No need	460	32.81
Need for fixed prosthesis	150	10.70
Need for partially removable prosthesis	588	41.94
Need for fully removable prosthesis	204	14.55
Prosthetic status		
No prosthesis	290	20.68
Fixed prosthesis	443	31.60
Partially removable prosthesis	461	32.88
Fully removable prosthesis	208	14.84

Table 3 shows the means of OHIP-49 items. Mean OHIP total score was $33.95(\pm 31.06)$. Using controlled regression, a short form of 14 items (OHIP-14T) was derived from the original 49 items. Three items (“Q2: pronunciation difficulties,” “Q16: eating discomfort,” “Q32: interrupts meals”) were identical on the OHIP-14T, OHIP-14C, OHIP-14J, OHIP-14K, and OHIP-14S.

Table 2 Reliability: internal consistency and test–retest reliability of the individual dimensions and OHIP-49

Dimension	Internal consistency ($n = 1402$)		Test–retest reliability ($n = 60$)	
	Cronbach's alpha	Ranges of item-scale correlation coefficients	Intra-class correlation coefficient	95% CI
Function limitation (9)	0.84	(0.15–0.60)	0.90	(0.85, 0.93)
Physical pain (9)	0.91	(0.28–0.80)	0.96	(0.94, 0.97)
Psychological discomfort (5)	0.81	(0.30–0.71)	0.86	(0.79, 0.91)
Physical disability (9)	0.97	(0.28–0.87)	0.92	(0.89, 0.95)
Psychological disability (6)	0.91	(0.37–0.90)	0.97	(0.96, 0.98)
Social disability (5)	0.86	(0.44–0.71)	0.88	(0.82, 0.92)
Handicap (6)	0.86	(0.30–0.84)	0.92	(0.87, 0.95)
OHIP-49	0.97	(0.12–0.91)	0.98	(0.97, 0.98)

Table 3 Means of OHIP-49 items and regression analysis of OHIP-49 items for all elders

Dimensions and items	Taiwan	Hong Kong	Japan	Korean	Slade	All subjects (<i>n</i> = 1402) Mean (SD)
OHIP-49						33.95 (31.06)
Functional limitation						7.75 (6.77)
Q1 difficulty chewing		c				1.30 (1.35)
Q2 trouble pronouncing words	t	c	j	k	s	0.53 (0.96)
Q3 noticed tooth that doesn't look right						0.76 (1.11)
Q4 appearance affected						0.44 (0.83)
Q5 breath stale						0.83 (1.05)
Q6 taste worse	t		j		s	0.84 (1.15)
Q7 food catching						1.38 (1.37)
Q8 digestion worse				k		0.89 (1.12)
Q9 dentures not fitting						0.72 (1.13)
Physical pain						7.15 (7.44)
Q10 painful aching			j		s	0.79 (1.08)
Q11 sore jaw	t					0.60 (0.94)
Q12 headaches				k		0.70 (0.99)
Q13 sensitive teeth						0.88 (1.15)
Q14 toothache						0.88 (1.10)
Q15 painful gums						0.86 (1.13)
Q16 uncomfortable to eat	t	c	j	k	s	0.95 (1.20)
Q17 sore spots		c				0.77 (1.09)
Q18 uncomfortable dentures						0.67 (1.09)
Psychological discomfort						3.61 (4.02)
Q19 worried by dental problems	t	c				0.83 (1.16)
Q20 self-conscious	t		j		s	1.01 (1.25)
Q21 dental problems made you miserable		c				0.65 (1.02)
Q22 felt uncomfortable about the appearance				k		0.43 (0.83)
Q23 felt tense			j	k	s	0.65 (0.97)
Physical disability						6.25 (6.48)
Q24 speech unclear						0.56 (0.96)
Q25 others misunderstood						0.54 (0.92)
Q26 less flavor in food		c				0.86 (1.18)
Q27 unable to brush teeth						0.55 (0.98)
Q28 avoid eating	t					1.63 (1.44)
Q29 diet unsatisfactory			j	k	s	0.68 (1.01)
Q30 unable to eat (dentures)						0.56 (0.99)
Q31 avoid smiling						0.39 (0.76)
Q32 interrupt meals	t	c	j	k	s	0.42 (0.79)
Psychological disability						3.61 (2.76)
Q33 sleep interrupted						0.67 (1.04)
Q34 upset		c				0.64 (0.97)
Q35 difficult to relax			j	k	s	0.60 (0.93)
Q36 depressed				k		0.62 (0.97)
Q37 concentration affected	t					0.60 (0.93)
Q38 been embarrassed	t	c	j		s	0.44 (0.81)
Social disability						2.20 (3.27)
Q39 avoid going out		c		k		0.54 (0.96)

Table 3 continued

Dimensions and items	Taiwan	Hong Kong	Japan	Korean	Slade	All subjects (<i>n</i> = 1402) Mean (SD)
Q40 less tolerant of others						0.35 (0.72)
Q41 trouble getting on with others		c				0.38 (0.71)
Q42 irritable with others	t		j		s	0.42 (0.77)
Q43 difficulty doing jobs	t		j	k	s	0.50 (0.88)
Handicap						3.40 (4.16)
Q44 your general health has worsened			j			0.93 (1.13)
Q45 financial loss				k		0.36 (0.70)
Q46 unable to enjoy people's company				k		0.41 (0.80)
Q47 life unsatisfying	t				s	0.65 (0.94)
Q48 unable to function		c	j		s	0.48 (0.89)
Q49 unable to work	t	c				0.51 (0.92)

Fourteen questions selected to maximize increase in total R^2 , with no more than two items per dimension permitted to enter the model

t Items of Taiwanese version of short-form OHIP. (OHIP-14T)

c Items of Chinese version of short-form OHIP. (OHIP-14C)

j Items of Japanese version of short-form OHIP. (OHIP-14J)

k Items of Korean version of short-form OHIP. (OHIP-14K)

s Items of original short-form OHIP developed by Slade. (OHIP-14S)

Cronbach's alpha and ICC values of OHIP-14T were 0.90 and 0.93, respectively.

Table 4 shows prosthetic need was statistically significantly associated with OHIP-49T ($F_{3,1389} = 6.09$, $P = 0.0004$), OHIP-14T ($F_{3,1389} = 5.51$, $P < .0001$), and OHIP-14S ($F_{3,1389} = 4.20$, $P = 0.0025$) while adjusting for covariates. The OHIP-14T scores for “need for fixed

prosthesis” and “need for full removable prosthesis” differed by 3.08, more than the OHIP-14S (2.59 score difference). Additionally, prosthetic status was also statistically significantly associated with these measures (OHIP-49T, $F_{3,1389} = 5.27$, $P = 0.0013$; OHIP-14T, $F_{3,1389} = 8.61$, $P = 0.0009$; OHIP-14S, $F_{3,1389} = 4.79$, $P = 0.0057$) in multivariable analysis. Among elders with prostheses,

Table 4 Discriminatory ability on all OHIP versions in assessing prosthetic need and status

Adjusted mean (SE)	OHIP-49T* (<i>n</i> = 1402)	OHIP-14T* (<i>n</i> = 1402)	OHIP-14S* (<i>n</i> = 1402)
Prosthetic need ^a			
No need	29.74 (1.50)	6.82 (0.43)	8.53 (0.12)
Need of fixed prosthesis	29.48 (2.52)	6.62 (0.73)	8.32 (0.71)
Need of partially removable prosthesis	34.54 (1.40)	8.02 (0.41)	9.63 (0.39)
Need of full removable prosthesis	40.16 (2.21)	9.70 (0.64)	10.91 (0.62)
$F_{3,1389}$	6.09	5.51	4.20
Effect <i>P</i> -value	0.0004	<.0001	0.0025
Prosthetic status ^b			
No prosthesis	39.09 (1.85)	9.86 (0.53)	10.66 (0.52)
Fixed prosthesis	33.43 (1.56)	7.94 (0.45)	9.71 (0.44)
Partially removable prosthesis	32.93 (1.61)	7.28 (0.47)	9.23 (0.45)
Full removable prosthesis	28.47 (2.22)	6.06 (0.64)	7.78 (0.63)
$F_{3,1389}$	5.27	8.61	4.79
Effect <i>P</i> -value	0.0013	0.0009	0.0057

^a Adjusted prosthetic status, gender, age groups, education, and dwelling status

^b Adjusted prosthetic need, gender, age groups, education, and dwelling status

* The OHIP-49T and OHIP-14T measures for Taiwanese elderly population. The OHIP-14S was developed by Slade

OHIP-14T scores for “no prosthesis” and “fully removable prosthesis” differed by 3.80, more than OHIP-14S (2.88 scores difference).

Discussion

The OHIP-49 was formally translated and validated into Chinese (Taiwan) in a manner culturally and linguistically appropriate to Taiwanese. Cronbach’s alpha (0.97) indicated its ability to measure a unique theoretical construct. The test–retest reliability of Taiwan version OHIP-49T (ICC = 0.86–0.97) matched the OHIP-49C [4] (ICC = 0.72–0.92) within a 2-week interval, exceeding the original OHIP-49 [3] (ICC = 0.42–0.77) within a 3-month interval. Regarding the OHIP-49T’s validity, the means of OHIP-49T scores differed significantly among clinical examinations of prosthetic need ($P = 0.0004$) and status ($P = 0.0013$). Thus, the OHIP-49T can be considered a good indicator of oral-health-related quality of life for elderly Taiwanese.

Slade’s [12] short-form OHIP (OHIP-14S), derived from a controlled regression procedure, resolves the length problem with 49 items while maintaining acceptable reliability and validity. Several short-form versions, such as Hong Kong’s OHIP-14C [4] and Korea’s OHIP-14K [5], were derived similarly. The OHIP-14T derived in this study has eight identical items to OHIP-14S, while OHIP-14T and OHIP-14C have six identical items. While the Taiwanese, Japanese, and Slade versions focus on worsening sense of taste, Hong Kong and Korea versions emphasize chewing or digestion. In the physical pain dimension, all versions agree on ‘uncomfortable to eat’. The Hong Kong, Japanese, and Slade versions focus on pain or soreness at unspecified places, whereas Taiwanese and Korean versions investigate pain or soreness at specific locations. Regarding physical disability, all versions agree on “interrupts meals”. The Japanese, Korean, and Slade versions emphasize dietary satisfaction, while the Hong Kong version emphasizes “less flavor” and the Taiwanese version emphasizes “avoid eating”. The items vary more in the dimensions of psychological discomfort, psychological and social disability, and handicap. Hence, cultural or societal differences were more obvious in psychological and social dimensions of the OHRQoL.

The OHIP-14T score was more discriminatory than OHIP-14S. Moreover, with regard to prosthetic need, participants with “fully removable prosthesis” had better OHRQoL than those with “partially removable prosthesis”. The results were nearly the same as another Taiwanese population-based study that used the SF-36 instrument [30].

In conclusion, the translated version of OHIP-49T showed satisfactory reliability and validity for a Taiwanese elderly population, and OHIP-14T is more effective to

measure OHRQoL among Taiwanese elderly than OHIP-14S.

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