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Validation of the Oral Health Impact on Daily Life Questionnaire (OHIDL) among Hong Kong older adults

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Abstract

Background: The Oral Health Impact on Daily Life Questionnaire (OHIDL) was developed through a qualitative study to measure oral health-related quality of life, including intensity and bother measurements, among older adults in Hong Kong. The instrument comprises 20 items divided into eight domains.

Objectives: This study describes the psychometric properties of the OHIDL and refines the instrument through validity and reliability testing.

Materials and methods: The OHIDL was administered to older adults who attended dental clinics for general dental treatments. Items with low discriminant ability were to be eliminated. Construct validity was assessed through convergent, divergent and factorial validity. Criterion validity was investigated by assessing the correlation between the measurements and the global questions. Reliability was assessed with Cronbach's alpha.

Results: In total, 306 participants (mean age: 69.6 years) completed the interviews. Two items for which over 90% of the participants reported no impact and two items with poor discriminant validity were eliminated. Both intensity and bother measurements demonstrated good construct and criterion validity, with the intensity measurement showing better performance being selected for the OHIDL to reduce the respondents' burden. The intensity measurement also showed satisfactory internal consistency.

Conclusions: The refined OHIDL with 16 items in seven domains is valid and reliable in measuring the oral health impacts on daily life among Hong Kong older adults.

KEYWORDS

older adults, oral health-related quality of life, reliability, validity

1 | INTRODUCTION

Oral health-related quality of life (OHQoL) as an outcome measurement can provide valuable information to decision-makers in terms of important determinants of care seeking, adherence to treatment regimens and satisfaction with the health care received.[1] OHQoL has been defined as "the impact of oral disorders on aspects of everyday life that are important to patients, with those impacts being of sufficient magnitude, whether in terms of severity, frequency or duration, to affect an individual's perception of their life overall."[2] According to this definition, oral health impacts do not automatically influence quality of life. To compromise one's quality of life, the impacts of oral health problems need to be severe and important enough to an individual. The results from a study conducted by Locker and Gibson[3] showed a gap between self-rated oral health status and satisfaction with oral health. Among the people who gave

their oral health status an unfavourable rating, only 50% of them were dissatisfied. In another study of Canadian adults, less than half of the respondents with oral health impacts reported being bothered by these impacts or their life being affected.[4] These study findings show that whether oral health impacts affect an individual's life as a whole may depend on that person's subjective perception.[5]

Over the past three decades, many instruments with different measurement schemes have been developed for measuring OHQoL.[6] The most common approach is to assess the "frequency" of oral health impacts by asking the participants how frequently they experienced each impact over a reference period, for example OHIP, GOHAI, OIDP and SOHSI.[7-10] As summarised by Locker and Allen, who appraised OHQoL measurements with regard to their development and validation process, despite their simplicity, the use of frequency measurements has been challenged for failing to capture the meaning and significance of the oral health impacts to the people who complete the questionnaire.[2] Other measurement schemes include subjective assessments of "severity" (eg OIDP), "satisfaction and importance" (eg OHQoL) and "effect" (eg OHQoL-UK (W) and DIP) into the OHQoL measurements.[11-13] However, their complex scoring method and the resulting multiplicative score have been criticised as having low reliability and being unsuitable for most statistical analyses.[14] A more appropriate approach is needed for OHQoL measurements to capture subjects' value of importance.

Although OHIP and GOHAI (the most commonly used OHQoL measurements) have been translated into Chinese and shown to be valid and reliable instruments.[15,16] The frequency of oral health impacts among older adults in Hong Kong measured by these instruments was found to be low even though oral diseases are commonly observed among them.[15-17] When comparing the short form of Chinese version OHIP-14 (derived following the same methodology procedures) to the original short form of OHIP-14, only five identical items were found. Furthermore, no identical item was selected for the domain of psychological discomfort and social disability.[15] These results indicate that some dimensions that matter to the older adults in Hong Kong may not be captured by the currently used instruments. Compared with people from Western countries, Chinese older adults have been found to have greater levels of acceptance in terms of tooth loss, appearance and other oral health problems, which can be explained by cultural differences.[18,19] The meanings of health and quality of life are affected by culture and vary between populations with different backgrounds and circumstances.[19] Evidence shows that culture influences a person's health-related quality of life rating, health appraisals, coping process and health/illness behaviours.[20-23] There is a need to conduct a qualitative study to investigate the ways older adults in Hong Kong perceive their OHQoL and how OHQoL is affected by their oral health condition.

Based on the above considerations, the Oral Health Impact on Daily Life Questionnaire (OHIDL) questionnaire was developed to measure OHQoL in Chinese older adults. A qualitative study was conducted to explore the older adults' perceptions of oral health impacts. Twenty items were generated from semi-structured interviews using a framework approach. With reference to the existing instruments which have been widely used in measuring OHQoL, such as Chinese version OHIP-14, GOHAI, OHQoL-UK(W) and OIDP,[8,9,12,15] the items were classified into eight domains: cleansing, eating, speaking, appearance, social, psychological, health and finance (Table 1). The details of the item-generation process have been reported in another paper.[24] OHIDL included items that were similar to those in the Chinese version OHIP-14, GOHAI, OHQoL-UK(W) and OIDP. Nevertheless, OHIDL contains more items related to eating and fewer items related to social activities, psychological aspects and handicap.

On the other hand, OHIDL evaluates OHQoL through the "intensity" and "bother" measurements. Subjects were asked to evaluate the intensity level they perceived the impact and the extent they had been bothered by the impact. The "intensity" question can be viewed as a combination of frequency and severity, which provides information to determine whether the impacts were of sufficient magnitude to affect the individuals' daily lives, while the "bother" measurement was intended to understand the individuals' perceptions of how their quality of life had been affected.

This paper aimed to further refine the constructed OHIDL through a series of psychometric tests and to verify its validity and reliability.

2 | MATERIALS AND METHODS

2.1 | Questionnaire design

The OHIDL comprises three parts. Part I includes a checklist of oral health problems and symptoms, which was extracted from the OHIP-49[7] and combined with those derived from the first-phase qualitative study. The participants were allowed to add any oral health problems they had other than the listed ones. Part II includes 20 items about the impacts of the oral health problems they experienced (reported in Part I) on daily living (Table 1). Additionally, there was an item designed to allow the participants to specify additional perceived impacts that were not included in the item set, as a supplement. The impacts were measured in two ways, using the intensity and bother measurements.

Intensity measurement: For each identified impact, the participants were asked to indicate its intensity. They were asked, "To what intensity level you perceive the impact?" The responses ranged from "none" to "very severe," with a score of 0 to 4, correspondingly. The intensity score was calculated by adding up the scores of the items for each domain (domain score) and for the whole scale (total score).

Bother measurement: After identifying the specific impact and the intensity, the participants were further asked, "To what extent have you been bothered by this impact?" Responses were recorded on a 5-point Likert scale ranging from 0 to 4, with 0 representing "not bothered at all" and 4 representing "bothered a great deal." The bother score was also calculated by adding up the scores of the items for each domain (domain score) and for the whole scale (total score).

Part III includes five global questions: (a) self-rating of oral health (from "very unhealthy" to "very healthy"); (b) satisfaction with oral

TABLE 1 OHIDL items and their underlying domains

Domains	Items
Cleansing	Have difficulty in or feel troubled when cleaning teeth or dentures
Eating	Limitation of the types or amounts of food
	Feel discomfort during eating
	Have difficulty in biting or chewing some types of food
	Unable to swallow comfortably
	Have to eat slowly, which results in a prolonged eating time
	Meal interruption
	Less flavour in food
Speaking	Unable to speak the way you want
Appearance	Appearance being affected
	Avoid smiling in front of people
Social	Uncomfortable to eat in front of people
	Limitation of contacts with people and friends
	Feel nervous or self-conscious in front of people
Psychological	Worried or concerned about the problems of teeth, gums or dentures
	Mood being affected, for example feel unhappy
Health	Digestion being affected
	Headache
	Sleeping being affected
Finance	Financial burden

health status (from "very dissatisfied" to "very satisfied"); (c) perceived overall impact of oral health on daily life (from "none" to "very severe impacts"); (d) extent of being bothered by oral health impacts (from "not at all" to "a great deal") and (e) overall life satisfaction (from "very dissatisfied" to "very satisfied").

2.2 | Study participants and sample size determination

Participants were recruited from the consecutive new patients at four dental clinics run by non-governmental organisations (NGO) from April to October 2012. Chinese older adults aged 55 years and above were invited to participate in the study. In Hong Kong, a person aged 60 years or above is commonly considered as an older person. In this study, we have extended the age to a few years younger to facilitate recruitment of participants. The recruited participants were asked to complete the OHIDL through face-to-face interviews at the clinics. An experienced interviewer conducted all of the interviews with the older adults. The study protocol was approved by The University of Hong Kong/Hospital Authority Hong Kong West Cluster Institutional Review Board (Reference no. UW12-081). The investigator explained the information sheet, and a signed consent form was collected from each participant.

According to Bonett,[25] the sample size was determined by the number of items contained in the instrument and the desired estimate precision of the planned α coefficient. For an instrument consisting of k items, the required size to estimate the α coefficient with the relative precision of δ at an α level can be calculated by the formula:

$$N = \left[8k/\left(k-1\right)\right]\left[z_{\alpha/2}/\ln\left(\delta\right)\right]^2 + 2,$$

with δ = (1 − LL)/(1 − UL), which denotes the relative precision of estimation, and LL and UL being the lower and upper bounds of the confidence interval.

With 21 items included in OHIDL and an expected α = .9 with 95% CI = 0.88-0.92, the required sample size was 204 to obtain a desired relative precision of 1.5 (δ = (1 − LL)/(1 − UL)) at a 0.05 level of significance. It was estimated that 20% of the participants would drop out the study and 30% of the participants would not receive any dental treatment after the first dental check-up. In order to follow up enough people to observe the changes in the oral health impacts after the treatments, the number of participants included in this validation study was increased to 306 regardless if they required treatment or not.

2.3 | Psychometric test and statistical analysis

The data were analysed to reduce the number of items and to refine the factor structure of the OHIDL. The psychometric properties of the OHIDL were assessed through examining its validity and reliability. The data analysis process for item reduction and refinement of OHIDL is shown in Figure 1. Items with extreme measurement values would have no more space to show any improvement or deterioration.[26,27] An item was considered to have low discriminant ability and would be eliminated if over 90 per cent of the responses were in the lowest or highest ranked response category, that is "none" or "very severe," respectively (ie with strong ceiling/floor effects).[28] This phenomenon of ceiling/floor effects has been widely reported in many studies.[29-32] Construct validity was assessed by examining the theoretical relationships of the items to each other and to the hypothesised domains.[33] Both convergent and divergent validity were examined by comparing the correlations between each item and different domain scores using multitrait scaling analysis.[34-36] Spearman rank correlation coefficient was calculated. According to Fayers and Machin,[33] convergent validity is supported by a moderate correlation with a coefficient of .4 or above between the item and the hypothesised domain score, while divergent validity is claimed whenever the item shows significantly higher correlation ($P < .05$) with the score of the domain to which it belongs than with other domain scores. The significant differences between the correlations were tested with Steiger's Z test using the FZT computator.[37] Any insignificant or reverse results were counted as scaling errors, and the item would be eliminated from the OHIDL. Confirmatory factor analysis (CFA) was also performed to demonstrate construct validity by exploring the fitting of the data with the theoretical factor structure.

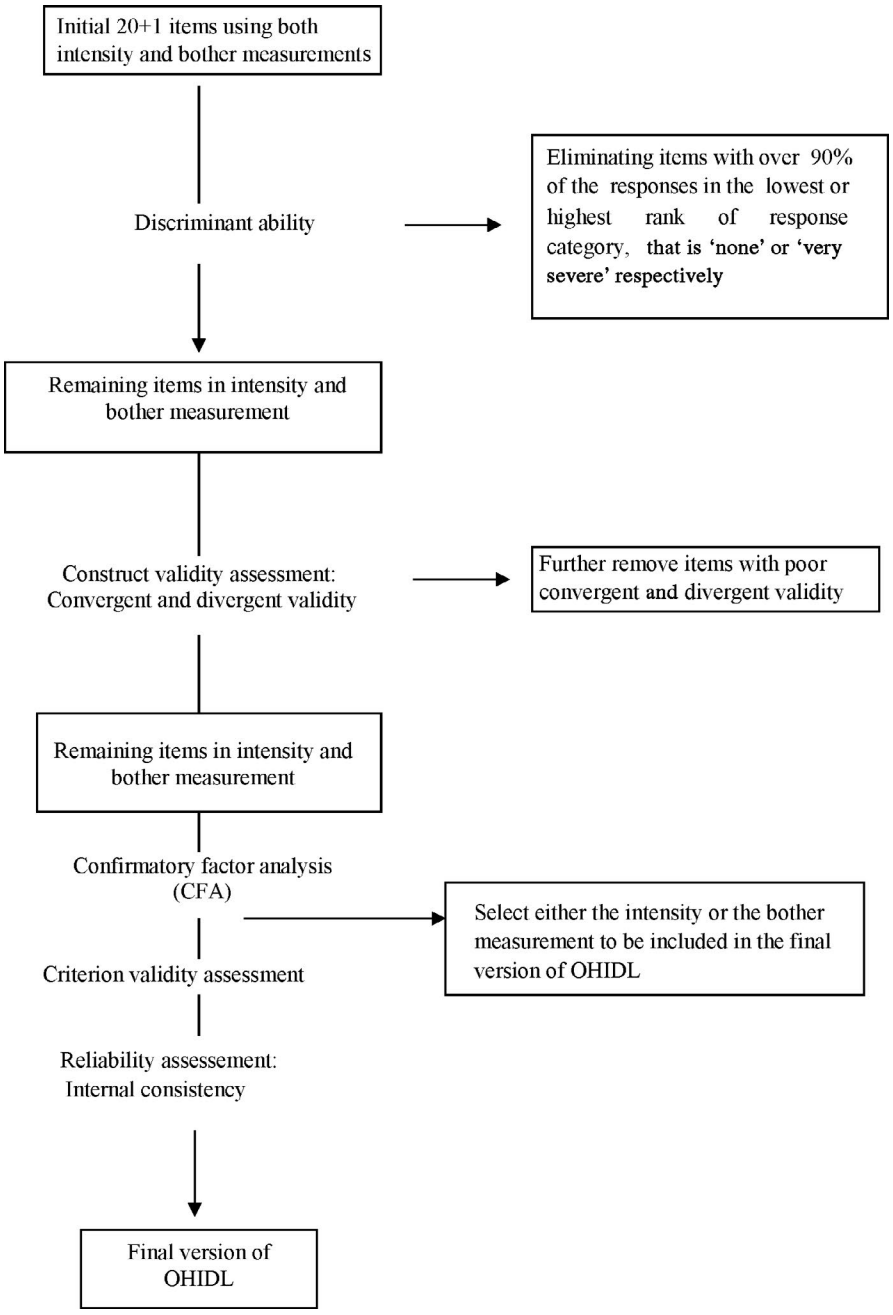

FIGURE 1 Flow chart of data analysis process for item reduction and refinement of OHIDL

Indices indicating good model fit include a non-significant test result ($P > .05$) of the Bentler scaled chi-square test statistic (χ^2), the ratio of the chi-square test and its associated degrees of freedom (χ^2/df) <2, a comparative fit index (CIF) and goodness-of-fit index (GIF) >0.95 and a root mean square error of approximation (RMSEA) <0.05.[38] The uni-dimensionality of the OHIDL was tested using principal component analysis. Evidence supporting a general factor was indicated by the dominance of the first eigenvalue and factor loadings >0.33.[39] According to Guyatt et al,[40] criterion validity concerns whether an instrument is measuring what it is intended to measure. In QoL research, global questions are commonly used as "the gold standard," and an instrument is valid if its results corresponded to the standard. In this study, the criterion validity was investigated by correlating the OHIDL scores with the global questions, including self-rated oral health status, satisfaction with oral health status, self-perceived oral health impacts on daily life and overall life satisfaction. Reliability was tested through internal consistency, with Cronbach's alpha ≥.8 regarded as a claim of good reliability.[33] The data were analysed using SPSS version 20 and LISREL version 8.80. The level of significance for all tests was set at .05.

3 | RESULTS

In total, 306 older adults completed the OHDIL questionnaire interview and their age ranged from 55 to 96 years (mean age: 69.6 ± 8.3, male: 41.2%) including both dentate (>95%) and edentulous persons. Table 2 shows the details of the participants' characteristics.

3.1 | Discriminant ability

The frequency distributions of intensity and bother measurements are summarised in Table 3. In general, the intensity of the reported impacts was not high, and the participants were not bothered much by these impacts. Items with strong ceiling/floor effects (over 90% of the participants reported no impact or not bothered by these impacts) were considered to have poor discriminant ability and were eliminated from the OHIDL. For the intensity of oral health impact, 91.8% of the participants reported no limitations in contacting people. For the bother measurement, 90.8% and 92.5% of the participants were not bothered by "cleaning difficulty" and "limiting contact with people," respectively As a result, these two items were eliminated from the OHIDL. In addition, the item "other impacts" was also removed, since few of the participants (4.2%) raised "other impacts" that were not included in the OHIDL (Table 3).

3.2 | Construct validity

After the first round of item reduction, the OHIDL contained 18 items, which were grouped into seven domains: eating, speaking, appearance, social, psychological, health and finance. Multitrait scaling analysis was not applicable for the "Speaking" and "Finance" domains, which contained only one item. For intensity measurement, corrected correlations between the 18 items and their domains ranged from 0.29 ("meal interruption" in the "Eating" domain) to 0.86 ("appearance affected" in the "Appearance" domain), generally indicating moderate to high convergent validity (Table 4). Poor discriminant validity was found for the items "swallow discomfort" and "digestion," which belonged to the "Eating" and "Health" domains, respectively. As no significant higher correlation was found between their hypothesised domain than other domains ($P > .05$), these two items were eliminated from the OHIDL. The convergent and discriminant validities of the bother measurement were quite similar to those of the intensity measurement. In general, the items were moderately to highly correlated with their domains ($r = .37$-$.77$). For the items "swallow discomfort" and "digestion," poor discriminant validity was found which was consistent with the results of the intensity measurement.

The factor structures of both the intensity and the bother measurements with the remaining 16 items were tested through CFA. Moderate to high factor loadings (λ) for the items were observed for both the intensity and bother measurements, ranging from 0.46 to 0.96 and 0.66 to 0.95, respectively. The goodness-of-fit indices are shown in Table 5. The insignificant differences between the observed data and the two theoretical models (chi-square test, $P > .05$) indicated excellent model fitting; also, the indices showed excellent fit as well, except for GIF. Compared with the bother measurement, the intensity measurement consistently fitted the hypothesised model better, with smaller ECVI.

The uni-dimensionality of the intensity and bother measurements was supported by a dominant first eigenvalue (5.95 and 7.10, respectively) compared to the second eigenvalue (1.83 and 1.58, respectively). The factor loadings in the first component for all the items were >0.33, ranging from 0.44 to 74 for the intensity measurement and 0.55 to 0.81 for the bother measurement.

TABLE 2 Characteristics of the study participants in the validation study

Socio-demographic factors (n = 306)	n (%)
Age	
55-59	28 (9.2)
60-64	72 (23.5)
65-69	60 (19.9)
70-74	58 (18.6)
75-79	48 (15.7)
≥80	40 (13.1)
Gender	
Male	126 (41.2)
Female	180 (58.8)
Education	
No formal education	50 (16.3)
Primary school	122 (39.9)
Secondary school	100 (32.7)
Tertiary education or above	34 (11.1)
People living with	
Single	52 (17.0)
Spouse or other older adults	111 (36.3)
Children or other younger people	143 (46.7)
Purpose of dental visit	
Regular dental check-up	55 (18.0)
Problem driven	251 (82.0)

3.3 | Criterion validity

Criterion validity of the OHIDL was supported, as each domain score and total score of the OHIDL for both the intensity and bother measurements was significantly correlated with all of the global ratings ($P < .01$, Table 6). Participants with higher intensity total scores had lower self-rating of oral health status ($r_s = -0.60$), were less satisfied with their oral health status ($r_s = -0.61$), had higher overall oral health impact ($r_s = 0.75$), were overall more bothered by the impacts ($r_s = 0.77$) and had less overall satisfaction with their life ($r_s = -0.46$). Compared with total score, the domain scores were less correlated with the global ratings. Strong correlations were found between the intensity and bother scores at each domain and the total scores ($r_s > 0.80$). The same correlation pattern with the global ratings was also observed among the bother scores.

3.4 | Reliability test

Reliability was only tested for the intensity measurement, which demonstrated better validity based on the above psychometric

TABLE 3 Frequency distribution of item responses for both intensity and bother measurements

	To what intensity level you perceive the impact? (%) (n = 306)					To what extent have you been bothered by this impact? (%) (n = 306)				
Items	None (0)	Mild (1)	Moderate (2)	Severe (3)	Very severe (4)	Not at all (0)	A little (1)	Somewhat (2)	A fair amount (3)	A great deal (4)
Cleaning difficulty	85.6	5.2	8.2	1.0	0	90.8	4.6	3.3	1.0	0.3
Food limitation	46.7	18.6	24.8	9.2	0.7	68.0	10.5	15.0	5.6	1.0
Eating discomfort	47.7	20.9	22.9	8.2	0.3	61.4	16.0	16.0	6.2	0.3
Chewing difficulty	45.1	17.6	21.2	15.0	1.0	60.8	15.7	13.7	8.2	1.6
Swallow discomfort	83.3	6.9	6.2	3.6	0	86.6	5.6	4.2	2.9	0.7
Eating time prolonged	52.6	18.0	24.5	4.2	0.7	69.9	12.4	13.1	4.2	0.3
Meal interruption	70.6	15.0	9.8	4.2	0.3	81.0	10.1	6.2	2.6	0
Less flavour in food	69.3	13.1	12.4	4.6	0.7	80.4	7.2	9.5	2.3	0.7
Speaking difficulty	75.2	12.7	8.2	3.3	0.7	83.3	8.5	5.6	2.3	0.3
Appearance affected	69.9	11.4	13.7	4.6	0.3	77.1	9.8	8.8	3.9	0.3
Avoiding smile	78.4	8.2	9.5	3.9	0	82.0	7.2	8.2	2.6	0
Uncomfortable to eat in front of people	82.0	7.8	7.8	2.3	0	84.6	7.8	5.2	2.3	0
Limiting contacts with people	91.8	2.9	3.9	1.3	0	92.5	2.3	4.2	1.0	0
Self-conscious	87.3	7.2	3.9	1.6	0	88.9	4.6	5.9	0.7	0
Worried or concerned	52.3	15.7	22.9	8.8	0.3	66.3	14.4	13.1	6.2	0
Mood affected	68.0	13.7	12.4	5.2	0.7	74.5	10.8	9.5	4.6	0.7
Digestion being affected	74.2	10.8	9.8	3.9	1.3	81.0	8.5	5.9	3.6	1.0
Headache	77.5	10.5	6.5	4.9	0.7	83.7	7.2	5.2	3.3	0.7
Sleep interrupted	73.9	8.5	10.5	5.2	2.0	79.4	8.2	6.9	3.9	1.6
Financial burden	54.9	10.8	19.9	12.1	2.3	65.4	11.1	13.4	7.2	2.9
Others	95.8	2.0	1.3	1.0	0	96.7	1.6	1.0	0.3	0.3

TABLE 4 Convergent and discriminant validity of OHIDL for both intensity and bother measurements

		Convergent validity		Discriminant validity	
Domain	No. of items	Intensity	Bother	Intensity	Bother
Eating	7	0.29-0.69	0.38-0.76	0.14-0.44	0.24-0.59
Speaking	1	–	–	–	–
Appearance	2	0.54-0.86	0.57-0.77	0.20-0.51	0.31-0.50
Social	2	0.44-0.64	0.44-0.65	0.21-0.48	0.21-0.50
Psychological	2	0.45-0.62	0.51-0.71	0.22-0.52	0.31-0.62
Health	3	0.32-0.44	0.37-0.48	0.06-0.46	0.18-0.52
Finance	1	–	–	–	–

TABLE 5 Goodness-of-fit of CFA for both intensity and bother measurements

	χ^2	*df*	*P*-value	χ^2/df	RMSEA	GIF	CFI	ECVI
Intensity	80.04	85	.63	0.94	0.00	0.87	1.000	0.61
Bother	94.91	85	.22	1.11	0.02	0.80	0.999	0.65

Note: Indices indicating good model fitting:
P-value >.05.
χ^2/df < 2.
RMSEA (root mean square error of approximation) <0.05.
GFI (goodness-of-fit index) >0.95.
CFI (comparative fit index) >0.95.
ECVI (expected cross-validation index) model with smaller value is better.

tests. The intensity measurement showed satisfactory internal consistency (Table 7), with Cronbach's alpha of .88 for the entire OHIDL, and ranged from 0.72 to 0.85 for the individual domains.

4 | DISCUSSION

The OHIDL was developed to quantify oral health's impacts on daily life using the intensity and bother measurements, both of which can serve as self-weighting approaches to incorporate respondents' values of importance.[41] The intensity measurement assesses the extent to which oral health problems affect individuals' daily life[4] and provides information to determine whether the impacts were "of sufficient magnitude to affect the individuals' daily lives."[2] Some current instruments have adopted this measurement method as a way to weight the items, for example the OHQoL-UK(W), because it can be assumed to be equal with importance.[12] The higher the importance value attached to the impact, the more bothered individual would be by that particular impact. A similar measurement is used in the OIDP, which assesses the amount of trouble caused by the oral health impacts.

Over 90% of the responses in this study reported no impact or not being bothered by the impacts of "cleaning difficulty" and "limiting contact with people." These two items were then eliminated from the OHIDL to avoid the strong ceiling/floor effect and poor discriminant properties. Only a few types of "other impacts" were raised by the participants, which indicate the comprehensive coverage of the OHQoL content, supporting the content validity. The convergent and discriminant validities of each item were similar when using both the intensity and bother measurements, supporting the construct validity of both. Both the intensity and bother measurements exhibited excellent goodness-of-fit with the proposed factor structure in the CFA analysis, with the intensity measurement demonstrating better results.

Both the intensity and bother measurements were significantly associated with all of the global ratings. The highest association was found with the assessment of overall oral health impacts on daily life, which can be viewed as an indicator of oral health-related quality of life, followed by self-satisfaction with oral health condition and subjective oral health status, which imply the subjective oral health status. The magnitudes of these correlations were moderate to high. Apart from that, the intensity and bother measurements were least associated with overall life satisfaction, which is considered an indicator of overall quality of life.[42] These study findings suggest that the underlying construct, as assessed by the intensity and bother measurements, is more like the concept of oral health-related quality of life than subjective oral health status. Also, oral health-related quality of life, as measured by the OHIDL, contributed to overall quality of life, although the correlation was only moderate. Furthermore, consistently higher correlations were observed for the intensity measurement, indicating its higher criterion validity.

The intensity and bother measurements generally behaved very similarly to each other in the validity tests, which indicate that their capacity to capture individuals' importance values was about the same. In order to reduce the respondents' burden, it was decided to include the intensity measurement in the final version of the OHIDL, which has better performance in psychometric tests.

TABLE 6 Spearman rank correlations among intensity measurement, bother measurement and global questions (n = 306)

	Self-rating of oral health	Satisfaction on oral health status	Overall oral health impact	Bothered by oral health impact	Life satisfaction	Intensity vs bother
Eating						
Intensity	−0.52	−0.49	0.66	0.59	−0.36	0.85
Bother	−0.45	−0.47	0.65	0.71	−0.34	
Speaking						
Intensity	−0.27	−0.33	0.33	0.31	−0.21	0.82
Bother	−0.25	−0.31	0.34	0.38	−0.20	
Appearance						
Intensity	−0.38	−0.47	0.41	0.47	−0.30	0.89
Bother	−0.41	−0.47	0.43	0.51	−0.29	
Social						
Intensity	−0.30	−0.35	0.37	0.43	−0.28	0.91
Bother	−0.30	−0.33	0.36	0.43	−0.25	
Psychological						
Intensity	−0.49	−0.50	0.61	0.71	−0.42	0.86
Bother	−0.45	−0.49	0.62	0.68	−0.41	
Health						
Intensity	−0.31	−0.28	0.38	0.46	−0.19	0.85
Bother	−0.30	−0.32	0.42	0.48	−0.20	
Finance						
Intensity	−0.36	−0.37	0.48	0.53	−0.31	0.82
Bother	−0.33	−0.36	0.51	0.54	−0.31	
Total score						
Intensity	−0.60	−0.61	0.75	0.77	−0.46	0.91
Bother	−0.52	−0.57	0.72	0.82	−0.41	

Note: All $P < .01$.

TABLE 7 Cronbach's alpha for intensity measurement

Domains	No. of items	Cronbach's α
Eating	6	.82
Speaking	1	—
Appearance	2	.85
Social	2	.75
Psychological	2	.73
Health	2	.72
Finance	1	—
OHIDL	16	.88

4.1 | Limitations

Several limitations can be identified in this study. Firstly, the construction and validation of OHIDL were carried out among Hong Kong older adults only, whether the instruments can be applied to other populations in measuring oral health impacts and the change over time needs further investigation. Thus, the validity and reliability of OHIDL should be further tested among other age groups and in different countries. Secondly, OHIDL only considers the negative impacts of oral health problems, which may limit the application in measuring the positive effects on quality of life resulting from different oral health conditions. Thirdly, duplication of the selected items to assess test-retest reliability was not carried in this study.

5 | CONCLUSION

Based on the findings of this research, both the intensity and bother measurements of the refined OHIDL, with 16 items in seven domains, demonstrated satisfactory validity and reliability and are thus appropriate in measuring the impacts of oral health on daily life among Hong Kong older adults. However, to avoid burdening the respondents in completing the questionnaire, only the intensity measurement is recommended for future use. Several aspects could be explored in future studies. Firstly, the logical relations between OHIDL domains and existing measurements can

be investigated according to a theoretical model to further establish construct validity. Also, the psychometric performance of the OHIDL can be compared with that of other Chinese versions of OHQoL measurements, for example the OHIP 49/14 and the GOHAI Chinese version. Secondly, the intensity measurement can be applied to developed instruments, to compare the performance of the frequency and intensity measurements in assessing OHQoL. For example, patients can be asked to rate the frequency and intensity for each item. Insight into these two types of responses can be obtained from observing the differences in the results.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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