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Development and Validation of the Oral Health Values Scale

Cierra B. Edwards[1] ⓘ | **Cameron L. Randall**[2] ⓘ | **Daniel W. McNeil**[1] ⓘ

[1]West Virginia University, Morgantown, WV, USA

[2]University of Washington, Seattle, WA, USA

Correspondence
Daniel W. McNeil, West Virginia University, Morgantown, WV, USA.
Email: dmcneil@wvu.edu

Abstract

Objectives: Oral health values, the degree to which one places importance on or demonstrates investment in improving or maintaining one's dental status, are believed to vary across individuals. Research on this construct is in its infancy, so a new Oral Health Values Scale (OHVS) was developed and validated. The aim was to create a multidimensional measure of oral health values that could be used in future epidemiological or behavioural investigations involving determinants of dental treatment-seeking behaviour and/or oral health.

Methods: The OHVS was developed in three cross-sectional phases. A 45-item pool was developed, and 12 expert raters from various oral health professions rated the items for their representativeness and relevance, as well as specificity and clarity. Based on the expert feedback, an initial 30-item scale was subsequently established and administered to a developmental sample (N = 306) using Amazon's Mechanical Turk (MTurk). The scale was further refined to be 12 items and its structure was confirmed in a validation sample (N = 308), also using MTurk. Correlations among OHVS scores and other oral health-related constructs were examined in the developmental and validation samples.

Results: Expert review of items for the oral health values construct and the OHVS provided initial evidence of content validity. The final 12-item scale exhibited a four-factor structure with good internal consistency, $\alpha = 0.84$. The psychometric properties of the final scale were confirmed in a second sample using confirmatory factor analysis, although evidence for the OHVS's four-factor structure was mixed. Overall, OHVS scores were consistently related to other oral health constructs in anticipated ways, providing evidence of construct validity.

Conclusions: The OHVS demonstrated content validity, internal consistency, and construct validity. Results suggest that the OHVS is a psychometrically sound instrument.

KEYWORDS

dental utilization, oral health, treatment-seeking, values

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1 | INTRODUCTION

Health behaviours are influenced by a multitude of psychological and social/environmental factors (eg, emotional state, attitudes and beliefs, education, social context, health policy, and access to care) that interact in complex ways.[1] One known influence on health behaviour is values towards health—or, the personal importance one places on health—which can influence the prioritization of certain health behaviours over competing or alternative behaviours in response to other demands and contingencies.[2] Theories and models of health behaviour suggest a critical role of values (eg, expectancy-value models, Theory of Planned Behavior), which often are informed by culture and context.[1]

Oral health values (OHV) can be defined as the extent to which one views dental status as important, or one's prioritization of or dedication to improving or maintaining one's teeth, gingiva, and aspects of orofacial functioning. The small size of this literature suggests OHV are understudied as compared to values related to other aspects of health and/or specific disease states. Still, OHV, like other health-related values, have been theorized to contribute to treatment-seeking behaviour, anticipating that those with greater OHV, for example, are more likely to attend dental appointments.[3-5] For instance, in their conceptual model of children's oral health, Fisher-Owens and colleagues propose that culture and the community oral health environment influence values, which shape views on oral health and, ultimately, oral health service use.[4] In addition, OHV may impact oral health-relevant behaviours, such as toothbrushing, flossing, smoking and nicotine use, and maintenance of a healthy diet.

Oral health values have not been directly assessed in studies of oral health status and its determinants. The closest related construct, widely studied and the focus of several well-validated assessment instruments, is oral health-related quality of life (OHRQoL). Underpinning OHRQoL is that complications from health conditions result in a significant impact on behaviour and functioning.[6] Health factors impact physical, mental and social functioning.[7] As such, the OHRQoL construct includes the impact of oral diseases on functioning and psychosocial and general well-being.[8] If functioning is impacted by oral conditions, quality of life and life satisfaction may be negatively impacted by poor oral health. Such consequences, however, need not be the result. That is, poor oral health may not be perceived as indicative of a poor life depending on how much an individual values their oral health. OHRQoL is related to OHV in that both involve perceptions of dental conditions and dental-related concepts.[9-12] As has been discussed by Locker and Allen, many health-related quality of life measures are criticized because they reflect the concerns of clinicians and researchers rather than what patients value or consider important.[11] Locker and Allen suggested what is missing from most measures of OHRQoL is acknowledgement of value systems and a comprehensive assessment of impact that takes into account relative importance of orofacial functioning.[10,11] Thus, to truly address how negatively or positively oral impairments are perceived to be, it is necessary to examine differences in OHV.

A better understanding of variation in OHV also may help explain differences in patterns of treatment utilization and may offer targets for various interventions, including those that aim to improve dental treatment-seeking behaviour. Additionally, improved understanding of OHV may advance what is known about OHRQoL. Currently, only a handful of measures have been designed to assess patients' attitudes about dental care,[13,14] but these have been published with limited information about their construction, reliability and validity. Moreover, no published measure has been specifically designed to measure OHV.

To address this gap in the literature, we developed an instrument to measure individuals' values towards oral health and oral health-related behaviour. This three-phase cross-sectional study followed guidelines from classical test theory and corresponding accepted best practices for scale construction.[15-17] First, items were developed and content validity was examined by experts. Second, exploratory principal component analysis (PCA) was conducted on a large, developmental sample to determine the underlying structure of the scale. It was anticipated that OHV would be positively associated with oral health literacy, oral hygiene behaviours and oral self-care. It was expected that OHV would be negatively related to oral health impact on quality of life, dental fear and distrust of dentists. Finally, the validity of the scale's structure was evaluated in a new sample.

2 | METHOD

2.1 | Participants

There were 12 experts who provided input on scale development. The developmental sample consisted of 306 adults in the USA; the validation sample included 308 adults in the USA. More information is in Supplementary Material.

2.2 | Measures

2.2.1 | Content validity

Each item was rated on two indices using 5-point ordinal scales: representativeness/relevance (1 = 'not at all' to 5 = 'essential to the construct') and specificity/clarity (1 = 'not at all' to 5 = 'extremely'), based on recommendations for scale construction.[18]

2.2.2 | Scale development

The 30-item version of the OHVS was used to measure the degree to which one demonstrates investment in improving or maintaining oral health. Information about participants' demographic characteristics and dental experiences was collected, along with various measures of oral health-related constructs, to explore their relation to OHV. The 14-item Oral Health Impact Profile (OHIP-14) was used to assess

OHRQoL.[19] Dental fear was assessed using the 20-item Dental Fear Survey (DFS).[20] The 14-item Health Literacy in Dentistry Scale (HeLD-14) was included as a brief measure of oral health literacy.[21] The 6-item Dental Neglect Scale (DNS) was included as a measure of oral hygiene behaviours and attitudes towards oral health.[22] The 28-item Revised Dental Beliefs Survey (R-DBS) was included as a measure of attitudes about and reactions to dental procedures and dental care.[23] Finally, to evaluate response biases in which participants display themselves in overly favourable ways, the 13-item Marlowe-Crowne Social Desirability Scale (MCSDS) was included.[24] All of these instruments have good psychometric properties.[25-28]

2.2.3 | Scale validation

The OHVS, OHIP-14 and MCSDS were included in the validation sample. A different measure of oral health literacy, the Comprehensive Measure of Oral Health Knowledge (CMOHK), was used to provide further evidence of convergent validity.[29] The CMOHK is a 23-item multiple choice measure of conceptual oral health knowledge. The Index of Dental Anxiety and Fear (IDAF-4C+) was used as an alternative measure of dental fear and anxiety.[30] The IDAF-4C + module on dental fear and anxiety consists of eight Likert-type items assessing fear of attending dental appointments. The Fear of Dental Pain Questionnaire (FDPQ), which measures fear of a variety of dental stimuli and situations with 18 Likert-type items, was included as a measure of discriminant validity (ie, it was not anticipated it would be related to oral health values).[31] The Importance of Dental Behaviours (IDB) was included as an alternative measure of OHV.[32] The IDB is a 9-item Likert-type scale of the relative importance of oral hygiene behaviours and retention of teeth originally designed for use in older adults. These instruments demonstrate good psychometric properties.[33-36]

2.3 | Procedure

A preliminary 95-item pool was generated via discussion and group processing with the authors' research team after identifying thematic areas of OHV following a review of literature related to the OHV construct and a conceptual mapping of themes. The pool was reduced to 45 items to eliminate redundancy and reduce burden; resulting from this process were 7-12 items across each of five thematic areas (ie, importance of keeping natural teeth, appearance, professional dental treatment, daily care and orthodontics/prosthodontics). These 45 items were evaluated by the 12 expert raters, who also provided qualitative feedback for modifying individual items and the scale as a whole. The scale was revised and reworded based on raters' evaluation and comments, yielding 30 items. Additional information about this process is in the Supplementary Material.

Participants in the developmental sample were recruited from Amazon's Mechanical Turk platform (MTurk) and compensated

$1.50 USD for their time. The survey was advertised as a study about answering questions related to dental experiences. Following consent, participants completed all study measures: OHVS, OHIP-14, DFS, DNS, HeLD, R-DBS, MCSDS and a demographic questionnaire. The OHVS was completed first and the demographics form was completed last; the order of all other measures was randomized. Responses were required on all items for respondents to continue moving forward with the study. Internal consistency and internal structure of the OHVS was examined to further refine item content and optimize scale length. Associations among OHVS scores and other study measure scores were examined to provide evidence of convergent validity.

The same procedure and recruitment method used for the developmental sample were utilized in the validation sample, but with different questionnaires to assess validity. Participants were required to answer each question. The structure of the OHVS was examined in this new sample to provide evidence for the validity of the scale; correlational analyses were conducted among the OHVS and other measure scores to further demonstrate the validity of the scale.

2.4 | Data analysis

2.4.1 | Content validity

Means/SDs of experts' ratings of item content were calculated and compared. See the Supplementary Material for more information.

2.4.2 | Scale development

An exploratory principal components analysis (PCA) was conducted with the 30 OHVS items; see the Supplementary Material. Correlational analyses were conducted using bootstrapping samples of 1000; 95% confidence intervals were calculated. Nearly all study measures were related to social desirability; therefore, partial correlations were conducted with OHVS scores in relation to OHIP-14, DFS, DIS, DNS, HeLD and R-DBS scores.

2.4.3 | Scale validation

A confirmatory factor analysis (CFA) was conducted with a structural equation model using the AMOS statistical package to determine if the four factors of the OHV found in the PCA from the developmental sample could be modelled as latent variables with the validation sample.[37] The items observed loading onto each factor were included in the model. The item that loaded most strongly onto each factor was theorized to be the best indicator of that factor and its factor loading was set to one. The four factors were allowed to covary in the model because there were moderate to large positive relations among them.

TABLE 1 Factor loadings of the Oral Health Values Scale (OHVS) from first principal component analysis with oblique promax rotation in the developmental sample

Items	1	2	3	4	5	6
1. Keeping my teeth healthy is a priority for me.		0.464				
2. It does not matter to me if I have healthy-looking teeth.[R]					0.551	
3. It is worth it to me to take time off work for a dental appointment.	0.623					
4. It is okay for me to miss a day or two of flossing when I am busy.[R]			0.755			
5. I would have a broken tooth fixed only if it caused me discomfort.[R]	0.643					
6. My smile is an important part of my appearance.		0.687				
7. Going to a dentist is not worth the cost to me.[R]	0.760					
8. Flossing my teeth every day is a high priority for me.			0.763			
9. I would not mind if I had to have a false tooth or dentures.[R]				0.836		
10. The way my teeth and gums look to other people is important to me.		0.637				
11. Dental care is less important to me than other needs in my life.[R]						
12. Brushing my teeth at least two times a day is important to me.						0.568
13. It would not bother me if my teeth looked yellow or stained.[R]					0.742	
14. I would prefer to save a tooth even if it would be a lot cheaper to have it pulled.				0.573		
15. If I have a toothache, I prefer to wait and see if it will go away on its own before seeing a dentist.[R]	0.689					
16. It would not bother me if I lost a tooth and it was visible to others.[R]					0.774	
17. I avoid foods and drinks that might stain my teeth.			0.654			
18. Going to the dentist is only important if my teeth or gums are bothering me.[R]	0.780					
19. I make sure I have dental floss available with me so I have it when I need it.			0.702			
20. I would be willing to put off dental care so that I could buy something I wanted.[R]	0.575					
21. Having healthy-looking gums is important to me.		0.551				
22. I would rather get dentures than spend money to treat cavities or gum disease.[R]				0.653		
23. Getting regular dental checkups is a good use of my time and money.	0.650					
24. It is a priority to me that my breath always smells nice.		0.727				
25. It is important to me to keep my natural teeth.				0.725		
26. I believe it is okay to skip brushing my teeth when I am busy.[R]						0.655
27. I think it is important for me to see a dentist regularly.	0.657					
28. I think it is important that my teeth and gums are a source of pride.		0.741				
29. Buying a new toothbrush every three to four months is a waste of my money.[R]						0.703
30. The condition of my teeth and gums is an important part of my overall health.		0.590				

Note: [R] Denotes reverse-scored items. Factor 1—*Professional Dental Care*, Factor 2—*Appearance and Health*, Factor 3—*Flossing*, Factor 4—*Retaining Natural Teeth*, Factor 5—*Negative Aesthetics*, Factor 6—*Toothbrushing*. Item loadings less than 0.40 were suppressed; no value is reported for item #11 as it was below 0.40.

Convergent and discriminant validity were assessed by examining the relation of OHVS scores to OHIP, CMOHK, IDAF-4C+, FDPQ and IDB scores. Correlational analyses were conducted using bootstrapping samples of 1,000; 95% confidence intervals were calculated. Study measure scores were significantly related to social desirability. Thus, partial correlations controlling for social desirability were conducted with OHVS scores in relation to OHIP-14, CMOHK, IDAF-4C+, FDPQ and IDB scores.

3 | RESULTS

3.1 | Content validity

The average rating of the 45 original items for representativeness/relevance was 3.9 (SD = 0.7) of 5, and approximately 49% of the items had an average rating of 4 or more. The mean rating for specificity/clarity across items was 3.8 (SD = 0.7) of 5, and 71% of the

items had an average rating of less than 4. Items with lower ratings were revised or removed.

3.2 | Scale development

No data were missing on any study measure. In the PCA, of the 30 items, 29 loaded strongly onto one of six factors, with a factor loading of 0.4 or higher. See Table 1 for item loadings. One item did not load strongly onto any one factor and therefore was eliminated from the scale. The final two factors extracted accounted for less than 5% of the overall variance. Parallel analysis additionally suggested a four-factor solution when comparing threshold eigenvalues computed in the analysis to the eigenvalues exhibited in the PCA. Thus, items loading onto the fifth and sixth factors were eliminated from the overall scale, reducing the scale to 23 items. The scale then was revised to include the three items that loaded most strongly (factor loadings ≥ 0.4) for each of the four factors to reduce scale length. The resulting 12-item scale has these subscales, based on factors: *Professional Dental Care*, *Appearance and Health*, *Flossing*, and *Retaining Natural Teeth*. See Table 2 for the OHVS. The internal consistency of the final 12-item OHVS was good (α = 0.84), and each of the four subscales had acceptable internal consistency (α = 0.70 to 0.80).

The four OHVS factor scores had small to large associations with each other, suggesting that while related, the factors measured somewhat different concepts. Table 3 presents the partial correlations among study measures. As expected, the OHVS and its four subscale scores were negatively associated with negative oral health impacts (as measured by the OHIP-14) and distrust of dentists (as measured by the R-DBS; although the *Flossing* subscale was not related), and positively associated with oral health literacy (as measured by the HeLD) and oral self-care (as measured by the DNS). The OHVS total score and the *Professional Dental Care* and *Retaining Natural Teeth* subscales were negatively associated with dental fear (as measured by the DFS).

Partial correlations between OHVS scores and oral health behaviours were conducted, controlling for social desirability. The *Flossing* subscale of the OHVS, but not the total score [95% CI [−0.05, 0.32], $r = 0.12$, $P = .034$], was related to toothbrushing behaviour. OHVS scores and all four subscales were positively related to the number of days a week a person flossed. Time between dental visits was negatively related to the OHVS total score and the four subscales, which indicates that those who scored higher on the OHVS had more frequent dental visits.

3.3 | Scale validation

As in the developmental sample, there were no missing data. The model resulting from the CFA showed acceptable fit overall on three of five measures,[38] $\chi^2 = 132.15$ (48, N = 308), $P < .001$, CMIN/DF = 2.75, SRMR = 0.066, CFI = 0.938, TLI = 0.915, RMSEA = 0.076. See Figure 1. While three indices showed acceptable model fit (ie, CMIN/DF, SRMR, RMSEA), two fit indices reflected relatively poor model fit (ie, χ^2, TLI). Standardized regression weights reflected that the model accounted for a large portion of the variance (39% to 87%) in the items for each factor. The OHVS scale had good internal consistency, α=0.85; each of its four subscales had high or acceptable internal consistency as well: *Professional Dental Care* (α = 0.71), *Appearance and Health* (α = 0.82), *Flossing* (α = 0.75) and *Retaining Natural Teeth* (α = 0.72).

A pattern of relations similar to that observed in the developmental sample emerged between OHV and other oral

TABLE 2 Final 12-item Oral Health Values Scale (OHVS)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. It is important to me to keep my natural teeth.	1	2	3	4	5
2. It is okay for me to miss a day or two of flossing when I am busy.[R]	1	2	3	4	5
3. My smile is an important part of my appearance.	1	2	3	4	5
4. Going to a dentist is not worth the cost to me.[R]	1	2	3	4	5
5. Flossing my teeth every day is a high priority for me.	1	2	3	4	5
6. I would rather get dentures than spend money to treat cavities or gum disease.[R]	1	2	3	4	5
7. I think it is important that my teeth and gums are a source of pride.	1	2	3	4	5
8. If I have a toothache, I prefer to wait and see if it will go away on its own before seeing a dentist.[R]	1	2	3	4	5
9. I would not mind if I had to have a false tooth or dentures.[R]	1	2	3	4	5
10. I make sure I have dental floss available with me so I have it when I need it.	1	2	3	4	5
11. Going to the dentist is only important if my teeth or gums are bothering me.[R]	1	2	3	4	5
12. The condition of my teeth and gums is an important part of my overall health.	1	2	3	4	5

Note: [R] Denotes items that are reverse scored. *Professional Dental Care* factor/subscale: Items 4, 8, 11; *Appearance and Health* factor/subscale: Items 3, 7, 12; *Flossing* factor/subscale: Items 2, 5, 10; *Retaining Natural Teeth* factor/subscale: Items 1, 6, 9.

TABLE 3 Partial correlations among the Oral Health Values Scale (OHVS) and subscales, and developmental sample measures, accounting for social desirability bias, with confidence intervals

| Variable	1	2	3	4	5	6	7	8	9
1. OHVS Total									
2. Attendance	0.79*** [0.74, 0.84]								
3. Appearance	0.78*** [0.73, 0.82]	0.51*** [0.40, 0.61]							
4. Flossing	0.74*** [0.68, 0.78]	0.42*** [0.32, 0.52]	0.43*** [0.34, 0.53]						
5. Retention	0.68*** [0.61, 0.74]	0.43*** [0.33, 0.52]	0.46*** [0.35, 0.55]	0.23*** [0.12, 0.33]					
6. OHIP-14	-0.32*** [-0.42, -0.21]	-0.34*** [-0.44, -0.23]	-0.19** [-0.29, -0.07]	-0.12* [-0.23, -0.01]	-0.32*** [-0.44, -0.20]				
7. DFS	-0.21** [-0.32, -0.09]	-0.35*** [-0.45, -0.28]	-0.03 [-0.15, 0.08]	-0.09 [-0.20, 0.03]	-0.14* [-0.26, -0.02]	0.54*** [0.46, 0.62]			
8. HeLD	0.38*** [0.29, 0.47]	0.38*** [0.27, 0.48]	0.33*** [0.20, 0.44]	0.17** [0.04, 0.28]	0.30*** [0.20, 0.39]	-0.45*** [-0.56, -0.32]	-0.31*** [-0.44, -0.19]		
9. DNS	0.71*** [0.64, 0.76]	0.66*** [0.57, 0.72]	0.50*** [0.40, 0.60]	0.53*** [0.45, 0.61]	0.41*** [0.30, 0.51]	-0.46*** [-0.55, -0.36]	-0.40*** [-0.50, -0.29]	0.44*** [0.35, 0.54]	
10. R-DBS	-0.27*** [-0.36, -0.16]	-0.42*** [-0.50, -0.32]	-0.11* [-0.23, 0]	-0.07 [-0.18, 0.05]	-0.20** [-0.30, -0.08]	0.58*** [0.49, 0.65]	0.65*** [0.57, 0.72]	-0.51*** [-0.62, -0.39]	-0.45*** [-0.53, -0.35]

Note: OHVS = Oral Health Values Scale; *Professional Dental Care, Appearance and Health, Flossing,* and *Retaining Natural Teeth* are OHVS factors/subscales.

Abbreviations: DFS, Dental Fear Survey; DNS, Dental Neglect Scale; HeLD, Health Literacy in Dentistry Scale; OHIP-14, Oral Health Impact Profile-14; R-DBS, Revised Dental Beliefs Survey.

*p<.05.

**p<.01.

***p<.001.
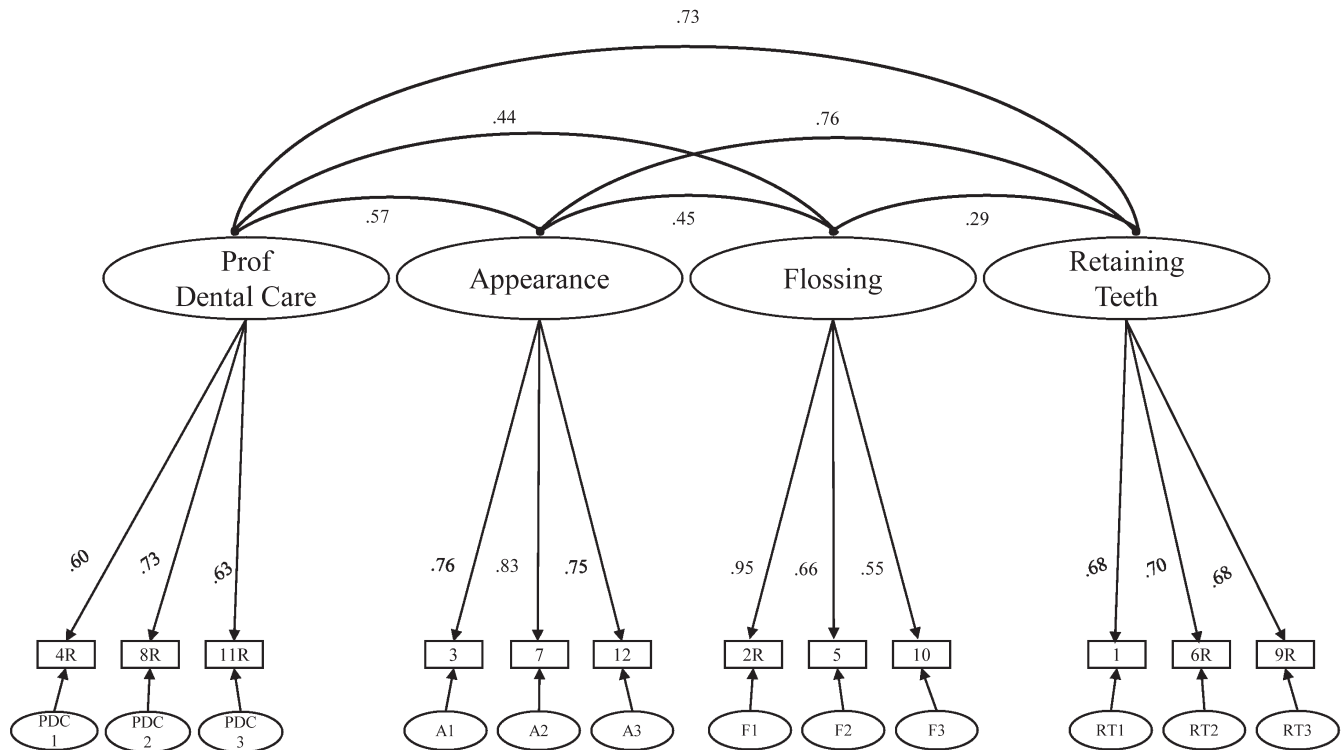
Note: Items with an *R* are reverse scored

FIGURE 1 Confirmatory factor analysis with structural equation modelling of the four factors, each reflecting value associated with *Professional Dental Care*, *Appearance and Health*, *Flossing*, and *Retaining Natural Teeth*, with standardized estimates

health-related constructs. The OHVS total score and its four subscales were negatively associated with negative oral health impact (OHIP-14), indicating that oral health values are related to better OHRQoL. As expected, the OHVS total score and all subscales except *Flossing* were positively related to oral health literacy as measured by the CMOHK. OHVS total score and the four subscales had moderate to large positive associations with the importance of oral self-care behaviours as measured by the IDB. The OHVS total score and all four subscales were negatively related to the IDAF-4C+, reflecting that individuals with stronger oral health values reported less fear of dental situations and stimuli. The OHVS total score and most subscales were unrelated to fear of dental pain, providing evidence of discriminant validity. Confidence intervals were consistent with correlation coefficients in all but one case, as subsequently noted.

Partial correlations between OHVS scores and oral health behaviours were examined, controlling for social desirability; see Table 4. Reported frequency of toothbrushing was positively but weakly related to the OHVS total score and its four subscales, except for *Retaining Natural Teeth* [95% CI [−0.03, 0.24], $r = 0.11$, $P = .046$]. The OHVS total score and the four subscales were weakly to strongly associated with reported flossing. Reported time between dental visits was negatively associated with the OHVS total score and the four subscales, suggesting greater OHV is associated with higher frequency of oral healthcare visits.

4 | DISCUSSION

This study involved the development and validation of a new scale, the OHVS, to measure the value one places on oral health. The content validity of the OHVS was examined, and results showed that items had medium to high representativeness/relevance and specificity/clarity. The OHVS was administered to a large, developmental sample; a four-factor structure was determined from principal component analysis, and the OHVS exhibited good internal consistency and evidence of convergent validity. Finally, the factor structure was validated in a new sample. Correlations among the OHVS and other measures of oral health-related constructs and oral health behaviours in the developmental and validation samples provided further evidence of convergent and concurrent validity. The total scale and its four subscales had high to acceptable internal consistency.

The four subscales reflected in the final OHVS assess many, but likely not all, relevant oral health value domains. Professional dental care, and its associated costs in terms of money, time, energy and focus, is an obvious area of value. Second, the appearance of one's teeth/gums and overall health clearly reflects an important aspect of oral health values. Third, flossing as a self-care behaviour may be indicative of personal investment and consistent behavioural output that reflects value. Fourth and finally, the retention of natural teeth, with implications for appearance and function, may (sometimes visibly) reflect oral health values. It

TABLE 4 Partial correlations among the Oral Health Values Scale (OHVS) and validation sample measures, accounting for social desirability bias, with confidence intervals

Variable	1	2	3	4	5	6	7	8	9
1. OHVS Total									
2. *Professional dental care*	0.80*** [0.76, 0.84]								
3. *Appearance and health*	0.76*** [0.71, 0.80]	0.45*** [0.35, 0.54]							
4. *Flossing*	0.70*** [0.64, 0.75]	0.41*** [0.31, 0.50]	0.35*** [0.26, 0.44]						
5. *Retaining natural teeth*	0.76*** [0.71, 0.80]	0.52*** [0.43, 0.60]	0.60*** [0.51, 0.68]	0.27*** [0.17, 0.37]					
6. OHIP-14	−0.35*** [−0.45, −0.25]	−0.30*** [−0.41, −0.19]	−0.23*** [−0.35, −0.11]	−0.12* [−0.23, −0.01]	−0.44*** [−0.53, −0.33]				
7. CMOHK	0.30*** [0.20, 0.39]	0.24*** [0.15, 0.34]	0.34*** [0.22, 0.46]	−0.02 [−0.11, 0.06]	0.40*** [0.30, 0.50]	−0.30*** [−0.41, −0.18]			
8. IDAF-4C+	−0.49*** [−0.57, −0.40]	−0.51*** [−0.59, −0.41]	−0.34*** [−0.43, −0.23]	−0.23*** [−0.34, −0.11]	−0.41*** [−0.50, −0.32]	0.53*** [0.44, 0.61]	−0.14* [−0.24, −0.05]		
9. FDPQ	−0.10 [−0.21, 0.01]	−0.18** [−0.28, −0.07]	0.01 [−0.13, 0.11]	−0.09 [−0.20, 0.02]	0.02 [−0.09, 0.12]	0.15** [0.06, 0.25]	0.02 [−0.08, 0.12]	0.43*** [0.34, 0.50]	
10. IDB	0.72*** [0.64, 0.78]	0.50*** [0.40, 0.59]	0.70*** [0.63, 0.76]	0.43*** [0.33, 0.52]	0.58*** [0.49, 0.66]	−0.29*** [−0.41, −0.18]	0.37*** [0.27, 0.46]	−0.34*** [−0.43, −0.24]	0.01 [−0.11, 0.12]

Note: OHVS = Oral Health Values Scale; *Professional Dental Care, Appearance and Health, Flossing,* and *Retaining Natural Teeth* are OHV factors/subscales.

Abbreviations: OHIP-14, Oral Health Impact Profile-14; CMOHK, Comprehensive Measure of Oral Health Knowledge; IDAF-4C+, Index of Dental Anxiety and Fear-4C+; FDPQ, Fear of Dental Pain Questionnaire; IDB, Importance of Dental Behaviours.

*$p<.05$.

**$p<.01$.

***$p<.001$.

is interesting that toothbrushing accounted for relatively little of the variance and so was discarded from the scale. Perhaps toothbrushing is so habitual for many, and so associated with social desirability responding, that it does not discriminate among degrees of value on oral health.

The OHVS shows promise for being a useful measure in epidemiological and behavioural dental research. A strength of this study was the developmental nature of the process in which the OHVS was developed and tested. Inclusion of an assessment of social desirability responding is rare in this type of research, but its demonstrated importance here encourages inclusion in related research in the future. There are, however, limitations inherent to the instrument's development and validation, and to the scale itself. First, the samples for development and validation were obtained online from residents of the USA in a cross-sectional manner, representing geographic restriction and precluding longitudinal analysis and thorough tests of dimensionality. As expanded upon in the Supplementary Material, in addition, participants from MTurk may lack representativeness and be more likely than those from other samples to exhibit demand effects (eg, social desirability) and other potentially biased responding.[39] It would be useful to have additional data from a cross-national and in-person sample to determine whether the results obtained here generalize to other populations. Second, though our application of the expert panel/rating approach is consistent with the literature,[16,17] another approach would have been to include formal focus groups to generate items and cognitive interviews with representative participants to further refine items for understanding and face validity. Nevertheless, the involvement of the authors' research team functioned essentially as a focus group. Future work to refine this first-ever measure of OHV might involve mixed-methods approaches. Finally, all measures used in the study were self-report, which may affect indices of behaviour (eg, toothbrushing), introducing the possibility of social desirability bias.

Overall, the OHVS with its total score and four subscale scores appears to a reliable and valid measure of OHV. While additional work is needed, the development of a more contemporary assessment of OHV provides opportunities for comprehensive epidemiological research and future intervention. By enhancing OHV, related oral health behaviours (eg, self-care, seeking professional dental services) may be impacted in a positive way.

ORCID

Cierra B. Edwards https://orcid.org/0000-0002-5526-4543
Cameron L. Randall https://orcid.org/0000-0002-5061-7450
Daniel W. McNeil https://orcid.org/0000-0002-0766-8455

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.