

Brazilian version of Positive Oral Health and Well-Being: cross-cultural adaptation and psychometric analysis

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Abstract: Specific measures to evaluate positive oral health have been in a nascent stage in Dentistry, especially in developing countries. The present study aimed to translate, cross-culturally adapt and evaluate the psychometric properties of the Brazilian version of Positive Oral Health and Well-Being (B-POHW). After forward-backwards translation to Brazilian Portuguese language, the cross-cultural adaptation of B-POHW was pretested, followed by the main study to perform psychometric analysis. We tested the model fit by Confirmatory Factor Analysis with categorical factor indicators in bifactor and simple structure models on a sample of 209 participants (mean age: 39.36 ± 12.26). Questionnaires about sociodemographic status, self-reported oral health-related outcomes, and general well-being were administered and used as external validation measures. Moreover, dental caries experience was clinically diagnosed. For test-retest reliability, 53 participants completed the B-POHW a fortnight later. The following results were found: a) the bifactor model presented the best model fit; b) the B-POHW demonstrated satisfactory internal consistency (Cronbach's α and McDonald's $\omega > 0.8$); c) the intraclass correlation coefficient suggested good reliability for the Global Factor of B-POHW in the test-retest (ICC = 0.84); d) evidence based on other variables and construct representation was in line with the positive oral health framework. The B-POHW is psychometrically sound to be used in a Brazilian context, and evidence of its internal structure confirmed its theoretical framework for measuring positive oral health. These findings advance in holistic approaches, enabling to assess positive oral health in Dental practice in Brazil.

Keywords: Oral Health; Quality of Life; Psychometrics; Factor Analysis, Statistical.

Introduction

The World Health Organization (WHO) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.¹ However, this concept is not sufficient to embrace the entire dynamic complexity of health.² Loads of models underpinning different visions to deal with the concept of health, some limited at a theoretical level, and others extended to



practical approaches.^{3,4} Many general health models were incorporated in oral health investigations, such as medical,³ biopsychosocial⁵ and salutogenic models.⁶ By understanding and combining different meanings of health, the prospects for improving medical outcomes and the quality of care may be enhanced. On the other hand, some key models are still at a nascent stage in Dentistry.⁷

One of these models is positive health, a concept grounded in the field of positive psychology that emphasises the potential to be and become healthy, even in the presence of illness.⁷ Although in the past positive health was understood more as rhetorical than a real commitment,^{8,9} the current conceptual framework is well defined and operationalised.⁷ The *Positive Oral Health and Well-Being* (POHW) is the first and, up to now, the only instrument developed to evaluate positive oral health specifically.¹⁰ Indeed, other scales (*e.g.*, oral health-related quality of life instruments) referred to positive health; however, their theoretical base remained largely hidden and unexamined.⁹ The POHW is conceptually robust, and its model followed theoretical concepts from Seligman⁷ and Locker,¹¹ breaking down the construct into three attributes: subjective-psychological, functional-social attributes, and biological-physical (Figure 1).¹⁰

The POHW has shown satisfactory psychometric properties in the United States, Germany, and Israel and may help consistently standardise positive oral health measurement.¹⁰ However, further analyses are necessary to provide evidence for the internal structure of this instrument. Besides, there is no evidence

of its psychometric properties from developing countries, where the prevalence of oral diseases and health perception differ from developed.¹² Therefore, the present study aimed to translate, cross-culturally adapt, and evaluate psychometric proprieties (reliability and internal/external validity) of the Brazilian version of Positive Oral Health and Well-Being (B-POHW).

Methodology

Population, setting and period of data collection

A cross-sectional study was conducted to translate, cross-culturally adapt, and validate the POHW for use in the Brazilian population. Data collection took place in dental clinics from two public universities located in southeast and southern Brazil. The minimum sample size stipulated was 200 participants.^{13,14} The sample comprised caregivers of children and adolescents that attended dental treatment in those institutions. All participants were native speakers of the Brazilian Portuguese language. Besides, participants under orthodontic treatment were excluded because they represent a barrier for an appropriate examination and evaluation of carious lesions.

Before the psychometric evidence assessment, the POHW was translated and cross-culturally adapted into the Brazilian Portuguese language. Data from this phase were not used for psychometric assessment. The instruments were self-administered in waiting rooms under supervision, followed

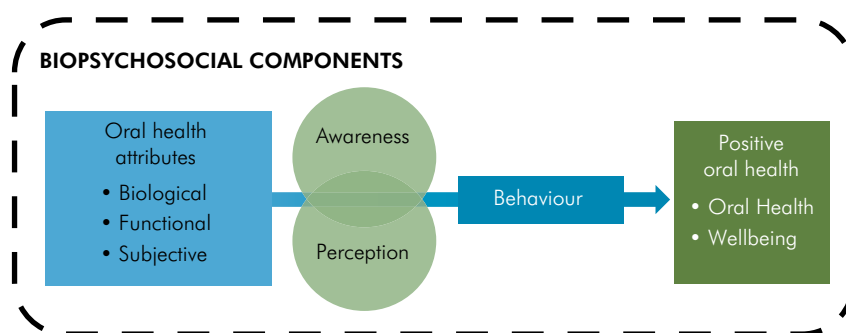


Figure 1. Theoretical model of POHW. Adapted from Validation of an innovative instrument of Positive Oral Health and Well-Being (POHW), by Zini et al., *Qual Life Res.* 2016;25(4):847–58. Copyright 2016 by Zini, Büssing and Vered.

by a dental clinical examination. The study was performed between June 2017 and June 2019. All steps were conducted following the Declaration of Helsinki and received approval from the Human Research Ethics Committee of the Federal University of Minas Gerais, Brazil, under protocol number 67189617.2.1001.5149.

Translation and cross-cultural adaptation

The POHW was translated and cross-culturally adapted according to standard procedures.^{15,16} Two native speakers translated the instrument independently into the Brazilian Portuguese language. A revision panel of specialists in validation studies evaluated the translations and developed the first synthesis version, which was back-translated into English by a bilingual translator. The back-translation was then sent to the authors of the original instrument for their comments. After receiving this feedback, a second synthesis version was developed into the Brazilian Portuguese language. This draft was tested on a focus group comprising ten adults of both genders who did not participate in the study's following phases. Next, some changes were introduced to the instrument to improve its readability. As some participants had different interpretations of the ninth item of the questionnaire ("I feel comfortable even when breathing near others"), we clarified that the content concerned halitosis. Besides, the header was detailed regarding the orientations for the participants. Finally, the panel of specialists and the original authors discussed and approved the B-POHW before the psychometric tests.

Psychometric evidence assessment

Reliability and validity assessments were conducted according to the CONsensus-based STANDards for the selection of health MEASUREMENT INStruments (COSMIN) checklist.¹⁴ The B-POHW was self-administered along with the Short General Well-Being Scale (SGWS), a questionnaire containing sociodemographic and oral health-related outcomes, followed by clinical dental examination. The sample comprised 223 volunteers.

Before data collection, a second pilot study was performed with 17 participants to test the

methodological approach and respondents' acceptance and compliance with the materials. Minor adjustments were made accordingly. Likewise, participants in the second pilot were excluded from the main study.

Measures

Positive Oral Health and Well-Being (POHW): This is a 15-item instrument focused on positive oral health's subjective and functional dimensions. Exploratory factor analyses pointed to two sub-constructs (Good Feelings and Positive Impact) which explained 60.0% of the variance.¹⁰ The response scale is a 4-point Likert scale, ranging from 0 (strongly disagree) to 3 (strongly agree). A total score is calculated by summing up the item scores. Higher scores indicate greater positive health.

Short General Well-Being Scale (SGWS): This is a four-item instrument to measure the general well-being of adults. Items are also responded on a 4-point Likert scale, ranging from 0 (strongly disagree) to 3 (strongly agree). Higher scores indicate higher general well-being.¹⁰

Sociodemographic and self-reported oral health-related outcomes: The following sociodemographic features were evaluated: age, sex, marital status, educational level, occupation, monthly household income (minimum family income = US\$ 292.64). Besides, oral health-related variables were investigated: dental visit (reason and frequency last year), smoking habits, use of prosthesis, presence of xerostomia, self-conception of oral health, and impact of oral health in life.

Dental clinical examination

Dental caries experience was evaluated through the DMFT (Decay, Missing, and Filled Teeth) index.¹⁷ Two dentists (Kappa for DMFT index: 0.88–0.90 for intra- and 0.83–0.90 for inter-examiner agreement) performed oral exams in the dental clinics after the participants signed an informed consent form. Participants stayed in a dental chair while the dentists examined the oral cavity to detect oral conditions using a mouth mirror (PRISMA, São Paulo, Brazil) and Williams probe (WHO-621; Trinity, Campo Mourão, Brazil). Moreover, information about the use of prostheses and xerostomia was also collected.

Data analysis plan

Data handling and statistical analysis were performed using the SPSS, v. 23.0, Factor 11.05 and Mplus v. 8.3.¹⁸ The internal structure of the B-POHW was tested through two models using Confirmatory Factor Analysis (CFA) with categorical indicators. The first model comprised a bifactor structure enrolling the Global Factor and two dimensions (Good Feelings and Positive Impact). A simple unidimensional structure CFA represented the second model. We assessed the model fit by the chi-square (χ^2), comparative fit index (CFI), the standardised root mean square residual (SRMR) and the root mean square error of approximation (RMSEA).¹⁹ The following thresholds were adopted to adjudge model fit: CFI > 0.90, RMSEA < 0.06, and SRMR < 0.10 for adequate fit; CFI > 0.95, RMSEA < 0.06, and SRMR < 0.08 for acceptable fit.¹⁹ Besides, the unidimensionality of the construct would be confirmed according the following indices: Unidimensional Congruence (UNICO) > 0.95, Explained Common Variance (ECV) > 0.80 and Mean of Item Residual Absolute Loadings (MIREAL) < 0.30.

The data distribution was evaluated by examining histograms, differences between mean and median, and the z-scores of Skewness and Kurtosis.²⁰ Cronbach's alpha (α) and McDonald's omega (ω) coefficients measured the internal consistency of the instruments.²¹ The assumption of the tau-equivalence hypothesis was previously tested. Moreover, test-retest reliability was estimated by relative indices between the data collected twice in a 14-day time interval with 53 participants.²² Relative reliability estimates concern consistency or association of position of individuals in a group relative to others. We used Spearman rank-order correlation coefficient (r_s) and Intraclass Correlation Coefficients (ICC) as relative indices. Besides, floor or ceiling effects were considered to be present if more than 15.0% of participants achieved the lowest or highest possible score, respectively.²³

The validity evidence based on other variables was tested by the correlation between B-POHW scores and some key variables (clinical outcomes, smoking habits, and SGWS score). Besides, construct representation was tested by independent-

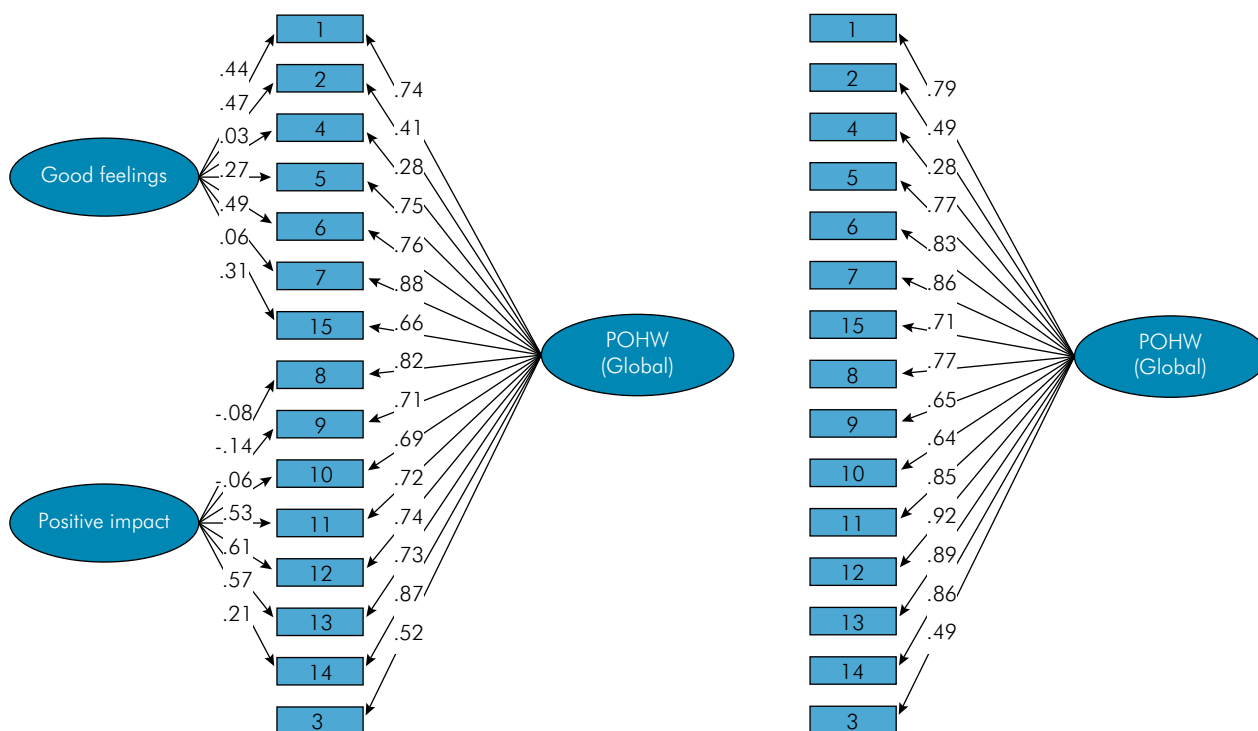
samples comparisons between B-POHW scores and oral health outcomes. Mann-Whitney U-test were reported with the correspondent effect size estimator $ES = \frac{Z}{\sqrt{n}}$, where z is the standardised value for the U-value.²⁴

Results

Two hundred nine participants comprised the final sample for the psychometric tests of B-POHW. The main reason for losses was incomplete responses of B-POHW in the first application (6.3%). Most participants were female (70.3%) and married (48.8%). Around 21.0% of the sample held a higher education diploma, while 11.1% were unemployed, and 77.9% had a monthly family income up to three minimum wages (US\$ 877.91). The mean age was 39.36 (\pm 12.26) years.

The bifactor and unidimensional simple structure models reached an adequate or acceptable fit for most indices, as illustrated in Figure 2. Despite the fact that the RMSEA suggested misspecification in the simple structure, all model fit statistics indicated a favourable internal structure for the bifactor model. However, the bifactor CFA presented some standard factor loadings lower than 0.30. This was the case for the dimension Good Feelings and its items 4 (0.03) and 7 (0.06), as well as for Positive impact and its items 8 (-0.08) and 10 (-0.14). On the other hand, most Standard factor loadings for the Global Factor ranged between 0.28 and 0.92, with all except from items 2 (0.41) and 4 (0.28) being higher than 0.50. The higher factor loadings between the indicator and global in the bifactor model suggest the better performance of one dimension. The unidimensionality was confirmed by the values of UNICO = 0.979 (0.970–0.992), ECV = 0.877 (0.850–0.917) and MIREAL = 0.235 (0.174–0.273).

Internal consistency of the Global Factor was also satisfactory for both B-POHW. Cronbach's α and McDonald's ω values were higher than 0.8. Since the tau-equivalent hypothesis was rejected ($p < 0.05$), the McDonald's ω was more meaningful as internal consistency coefficient. Fifty-three (25.4%) participants answered the test-retest. The Spearman coefficient and ICC indicated a good reliability (> 0.70). The



χ^2 : Chi-Square; df: degrees of freedom; CFI: comparative fit index; RMSEA: root mean square error of approximation; SRMR: standardized root mean square residual.

Figure 2. Model fit indices: $\chi^2 = 156.73$ (df = 76, $p < 0.01$), CFI = 0.986, RMSEA = 0.071 ($p < 0.05$, 90%-CI = 0.055-0.087), SRMR = 0.044. b) Unidimensional simple structure CFA with categorical factor indicators. Model fit indices: $\chi^2 = 449.459$ (df = 90, $p < 0.01$), CFI = 0.939, RMSEA = 0.138 ($p < 0.05$, 90%-CI = 0.126-0.151), SRMR = 0.077.

Table 1. Descriptive Statistics, Internal Consistencies in the B-POHW (n = 209).

Measure	Mean	Median	SD	Range	Skewness (z-score)	Kurtosis (z-score)	Reliability				Floor/Ceiling effects (%)	
							α	ω	r_s	ICC		
B-POHW												
Global factor	25.83	26.0	10.59	45.0	-0.25 (-1.48)	-0.71 (-2.11)	0.92	0.92	0.85	0.84	0.5/1.0	
Good feelings	10.18	10.0	5.09	21.0	0.12 (0.70)	-0.94 (-2.80)	0.84	0.86	0.75	0.72	0.5/1.0	
Positive impact	13.32	14.0	5.83	21.0	-0.66 (-3.91)	-0.43 (-1.29)	0.87	0.88	0.74	0.78	3.8/8.1	
SGWS												
General well-being	7.69	8.0	3.21	12.0	-0.46 (-2.75)	-0.39 (-1.15)	0.87	0.88	0.73	0.76	3.4/17.3	

B-POHW: Brazilian version of the Positive Oral Health an Well-Being; SD: standard deviation; ICC: Intraclass correlation coefficient; SGWS: short General Well-Being scale.

floor and ceiling effects were lower than 15.0% for the B-POHW scores, but the ceiling effect reached 17.3% to the SGWS. These results are depicted in detail in Table 1.

Table 2 displays the results of validity evidence based on relations to other variables. The Global

Factor of B-POHW, and their dimensions, correlated with clinical outcomes, smoking habits, and general well-being from week to strong (0.21–0.69, $p < 0.01$). Moreover, the construct representation embraced most oral health outcomes with effect sizes ranging from small to large (0.21–0.77), as showed in Table 3.

Table 2. Correlation between B-POHW and oral health-related outcomes, and general well-being (n = 209).

Variable	B-POHW		
	Global factor	Good feelings	Positive impact
B-POHW			
Global factor	1.00	-	-
Good feelings	0.92*	1.00	-
Positive impact	0.94**	0.76**	1.00
Clinical outcomes			
Dental caries	-0.44**	-0.48**	-0.35**
Missing tooth	-0.34**	-0.29**	-0.35**
Smoking habits			
Number of cigarettes	-0.27**	-0.21**	-0.26**
SGWS			
General well-being	0.69*	0.61*	0.67**

* Pearson correlation ($p < 0.01$); ** Spearman correlation ($p < 0.01$); B-POHW: Brazilian version of the positive oral health and Well-Being; SGWS: Short General Well-Being Scale

Discussion

The POHW is the first instrument to systematise the evaluation of Positive Oral Health through a validated questionnaire. Although this instrument has been limited to developed countries, the present study introduced the potential use of POHW in developing countries populations. There is no intention to replace other oral health-related quality of life instruments, but POHW brings an additional and relevant perspective for this area. This instrument is the first which measures positive oral health instead of impaired oral health.¹⁰ The Brazilian version of POHW presented reliability and construct validity in line with the original study.¹⁰ Although the factorial structure was not supported in entirety, the analysis in the structural validation found a fair model fit in a global level for the bifactor model.

Indeed, the POHW has characteristics that make it an attractive and eligible instrument. First, the small number of items make it suitable for epidemiological studies with large samples or research settings when time is restricted.²⁵ Second, there is no ‘negatively worded’ item, avoiding reverse thinking along the scale.²⁶ Third, the originality and practicality of encompassing a robust theoretical background in

positive oral health, it is one of the main highlights of the POHW.¹⁰

The POHW has a 4-Likert response format without a neutral midpoint. There is a debate about the neutral midpoint, as missing it may force respondents to take a side other than indifference.²⁶ Moreover, the length of the response format influences the structural analysis. Studies suggest treating the data as categorical in measures with a 4-point scale.^{27,28} Comparing both models, it was expected that the bifactor presented better fit indices since this is in line with the conceptual framework of the POHW, embracing the dimensions Good Feelings and Positive Impact. The saturation and double-loadings also contributed to a better model fit.²⁹ The lower standard factor loadings between some indicators and dimensions suggest the B-POHW results should primarily be interpreted at the global level.

The B-POHW reliability was assessed by internal consistency and test-retest stability. Cronbach’s α and McDonald’s ω coefficients ranged into point estimates considered acceptable in the literature (0.70–0.95) in all factors. Therefore, the set of items are closely related to measure the same construct.³⁰ Although the coefficients presented similar scores, the ω is a more reliable estimator than α because it does not assume essential tau-equivalence.²¹ The test-retest showed good reliability for the B-POHW scores between the two applications and, consequently, suggests a good stability of the instrument.³¹

Following the framework supporting the construct, the B-POHW scores were inversely related to dental caries experiences (moderately) and smoking habits (weakly) and strongly and positively related to general well-being. The construct representation was clarified by mean/median comparisons between oral health grouping variables. The use of prosthesis was the only outcome with no significant difference for the positive oral health in the dichotomic picture. Probably, satisfaction, time of use and quality of the prosthesis may influence the oral health perspective and should be considered in future studies using the POHW.

Conclusion

Oral health care providers should aim to understand their patients holistically. Cross-cultural

Table 3. Construct representation of the B-POHW with oral health outcomes.

Variable	B-POHW											
	Global factor					Good feelings					Positive impact	
	Mean (SD)	Median (Min.-Max.)	ES	p-value	Mean (SD)	Median (Min.-Max.)	ES	p-value	Mean (SD)	Median (Min.-Max.)	ES	p-value
Dental visit (reason)												
Checkup	31.40 (8.01)	31.0 (11.0-44.0)	-0.58	< 0.001	12.81 (4.45)	13.0 (4.0-20.0)	-0.56	< 0.001	16.00 (4.19)	16.50 (0.0-21.0)	-0.52	< 0.001
Emergency	19.18 (9.74)	18.0 (0.0-43)			7.02 (4.27)	6.0 (0.0-19.0)			10.10 (5.94)	11.0 (0.0-21.0)		
Dental visit (frequency last year)												
None	23.38 (10.41)	23.0 (0.0-43.0)	-0.21	0.002	8.72 (4.91)	8.0 (0.0-20.0)	-0.25	< 0.001	12.47 (5.92)	13.0 (0.0-21.0)	-0.14	0.05
One or more	27.74 (10.32)	29.0 (2.0-45.0)			11.31 (4.91)	11.0 (2.0-21.0)			13.97 (5.71)	15.0 (0.0-21.0)		
Presence dental caries												
Yes	21.12 (9.46)	22.0 (0.0-39.0)	-0.42	< 0.001	7.64 (4.04)	7.0 (0.0-18.0)	-0.47	< 0.001	11.33 (5.86)	12.0 (0.0-20.0)	-0.33	< 0.001
No	29.99 (9.80)	31.0 (5.0-45.0)			12.42 (4.87)	13.0 (1.0-21.0)			15.07 (5.23)	16.0 (0.0-21.0)		
Missing tooth												
Yes	23.07 (10.13)	23.50 (0.0-44.0)	-0.31	< 0.001	8.92 (4.75)	9.0 (0.0-20.0)	-0.28	< 0.001	11.87 (5.84)	13.0 (0.0-21.0)	-0.30	< 0.001
No	29.42 (10.14)	31.0 (4.0-45.0)			11.81 (5.08)	13.0 (1.0-21.0)			15.19 (5.29)	16.0 (0.0-21.0)		
Smoking habits												
Yes	17.74 (10.93)	17.0 (2.0-43.0)	-0.25	< 0.001	7.09 (4.65)	6.0 (2.0-19.0)	-0.22	0.002	8.91 (7.00)	10.0 (0.0-21.0)	-0.23	< 0.001
No	26.83 (10.14)	27.5 (0.0-45.0)			10.56 (5.02)	10.0 (0.0-21.0)			13.86 (5.45)	14.0 (0.0-21.0)		
Use of Prosthesis												
Yes	25.24 (12.41)	26.5 (5.0-43.0)	-0.02	0.83	10.29 (6.09)	10.5 (1.0-20.0)	-0.01	0.97	12.56 (6.85)	13.5 (0.0-21.0)	-0.03	0.64
No	26.09 (10.18)	26.0 (0.0-45.0)			10.22 (4.88)	10.0 (0.0-21.0)			13.55 (5.56)	14.0 (0.0-21.0)		
Xerostomia												
Yes	22.25 (10.21)	23.0 (0. -43.0)	-0.28	< 0.001	8.70 (4.74)	9.0 (0.0-19.0)	0.23	< 0.001	11.34 (5.82)	12.0 (0.0-21.0)	-0.30	< 0.001
No	28.59 (9.81)	29.0 (2.0-45.0)			11.26 (5.01)	11.0 (1.0-21.0)			14.89 (5.11)	16.0 (0.0-21.0)		
Self-perception of oral health												
Good	33.95 (7.34)	35.0 (11.0-45.0)	-0.74	< 0.001	14.38 (3.84)	15.0 (4.0-21.0)	-0.77	< 0.001	16.91 (4.00)	18.0 (0.0-21.0)	-0.64	< 0.001
Poor	15.44 (8.52)	14.5 (0.0-39.0)			5.02 (3.00)	4.50 (0.0-15.0)			8.42 (5.88)	8.0 (0.0-21.0)		
Impact of oral health in life												
High	21.58 (11.52)	22.0 (0.0-44.0)	-0.34	< 0.001	8.47 (5.25)	7.0 (0.0-20.0)	-0.32	< 0.001	10.88 (6.64)	12.0 (0.0-21.0)	-0.32	< 0.001
Low	29.45 (9.19)	29.5 (5.0-45.0)			11.83 (4.76)	12.0 (1.0-21.0)			15.23 (4.75)	16.0 (0.0-21.0)		

B-POHW: Brazilian version of the Positive Oral Health and Well-Being; SD: standard deviation; ES: effect size estimates for Mann-Whitney U-test.

adaptation of a positive health measure may have a promising and broad application in clinical and epidemiological investigations. For a long period, positive oral health was evaluated partially or by unequivocal theoretical knowledge. However, the POHW presents an opportunity to address this limitation in oral health research. Future studies may further investigate the extent to which other oral conditions reflect positive health. The present findings support the psychometric evidence of the B-POHW and represent the first steps for the consolidation of positive oral health research based on valid instruments.

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