

ORIGINAL ARTICLE



Scale of self-efficacy in oral hygiene (OHSE): analysis of psychometric properties in Spain

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ABSTRACT

Aim: Oral self-efficacy has been shown to be an important variable in predicting successful treatment, preventing health risks and encouraging health-promoting behaviour. In the context of oral health, it is of paramount importance to facilitate the use of the Oral Hygiene Self-Efficacy Scale (OHSE) in clinical practice. The aim of this study was to analyze the psychometric properties of the OHSE scale in a sample of Spanish adults and offer standards for interpreting the scale.

Method: A sample of 360 people aged from 18 to 75 years was assessed using the OHSE scale. The scale was culturally adapted and translated, reliability tests, construct validity, comparison of means by sex and age group were carried out, and scales for evaluating the responses were prepared.

Results: After eliminating six items, the reliability and validity analyses showed adequate psychometric properties. There were no differences between sex or age group.

Conclusion: The OHSE scale for a Spanish adult population has sufficient empirical support to be considered a valid and useful instrument with solid psychometric properties and it offers an opportunity for oral health education intervention programs aimed at the adult population.

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Introduction

Some aspects relating to oral health should be addressed from a bio-psychosocial point of view [1] as patients' adoption of healthy life habits in general and healthy odontology habits, in particular, is highly dependent on psychosocial factors [2,3]. In particular, self-efficacy has been identified as a potentially important variable for predicting successful oral treatment [2,4–6]. Bandura [7] defined self-efficacy as the set of beliefs individuals have in their own ability to successfully organize and execute the behaviour required to enable certain successful results. Cognitive Social Theory [8] maintains that human motivation and behaviour are regulated by thought, involving the expectations and results of a given situation and the self-efficacy employed [9].

Health belief systems, which are a type of social cognition model, argue that people's behaviour is best understood by examining their attitudes and beliefs and that levels of self-efficacy can increase or decrease motivation for dental medical treatment [10]. In these models, self-efficacy is a central element in increasing salutogenic behaviours and reducing patients' health risk behaviours [1,10–14]. Therefore, greater self-efficacy in patients who attend dental consultations is associated with seeking treatment earlier, a more optimistic attitude [15], more frequent visits [16] and increased tooth brushing and flossing [17,18].

Consequently, higher self-efficacy is linked to better physical and mental health [13,19] and to a better pattern and development of chronic conditions [15,20,21]. It has also been observed that higher self-efficacy is linked to better COVID-19 preventive behaviour and better physical, emotional and mental health during this pandemic [22].

Instruments that assess dental self-efficacy are very useful for predicting patients' oral health-related behaviour. However, research into self-efficacy in oral health is new and so there are few studies compared to other areas of health. Some countries such as Japan, Finland and Germany have instruments adapted to their national contexts [23–25], but in Spain, there are still no instruments that have been shown to have adequate psychometric properties. One of the most widely used instruments internationally for evaluating dental self-efficacy is the Oral Hygiene Self-Efficacy Scale (OHSE) [26]. This scale was originally developed in English and has been translated into multiple languages, such as Turkish, Hindi and German [14,27], and applies to all ages and to patients with periodontal involvement, caries, gingivitis, diabetes or cancer [4,14,24,26,27]. Although the OHSE is a widely-used instrument, previous studies analyzing its psychometric properties have been conducted using methods that are not very robust and accurate [4,27].

Given the importance of oral self-efficacy in preventing risk behaviour and fostering health-promoting conduct in the context of odontology, facilitating the use of OHSE in clinical practice is paramount. In view of this, the main aim of this study was to analyze the psychometric properties of OHSE in a sample of Spanish adults, translate and cross-culturally adapt the OHSE, study the dimensionality of the scale, observe the differences between the sociodemographic variables and offer a standard for interpreting the scale.

Method

Participants and procedure

This study was of cross-sectional design and was approved by the Ethics Committee of the Rey Juan Carlos University of Madrid (Ref.1504202110421). The participants in the present study comprised 360 adult patients who attended private Spanish clinics during September, October, and November 2020. 66.80% of the participants were women. The participants' ages ranged from 18 to 75 years old ($M = 32.47$; $SD = 12.99$) with 48.30% aged under 30.

The sample size was defined by calculating for each dimension the size needed to analyze the multivariate model of the association between the component items at a 95% confidence level while satisfying De Moivre's theorem of estimated frequency greater than 10 so that the fit and likelihood statistics could be expressed using a chi-squared statistic. A minimum of 100 cases is recommended for models with five or fewer constructs in Confirmatory Factor Analysis (CFA). The maximum required sample size of the dimensions was considered, with an approximate value of 300 cases. The questionnaire was completed on a Google Forms platform to avoid object contact during the COVID-19 pandemic. The link to the questionnaire was sent via e-mail or WhatsApp to respondents' mobile devices (the respondents chose their preferred method).

Instrument

Oral Hygiene Self-Efficacy scale (OHSE) in adults

The OHSE was modified according to the guidelines of the International Test Commission (ITC) [28]. In order to adapt the instrument to the Spanish context, two native linguists translated the text and then reverse translated the scale items (English–Spanish–English). A Spanish version was obtained from the English version [26]. This process was repeated three times to ensure linguistic and cultural concordance. The Spanish version was then revised by two bilingual researchers. Finally, the content was reviewed by a committee of experts in oral health and health psychology, who concluded that the Spanish version was adequate [29] (Figure 1).

This study used the English version of the OHSE questionnaire [26], eliminating the two items that relate to oral care in diabetes, as they are not relevant to the study [25]. Similarly, the item 'When do you have a headache or feel bad?' was divided into two items. This change has also been

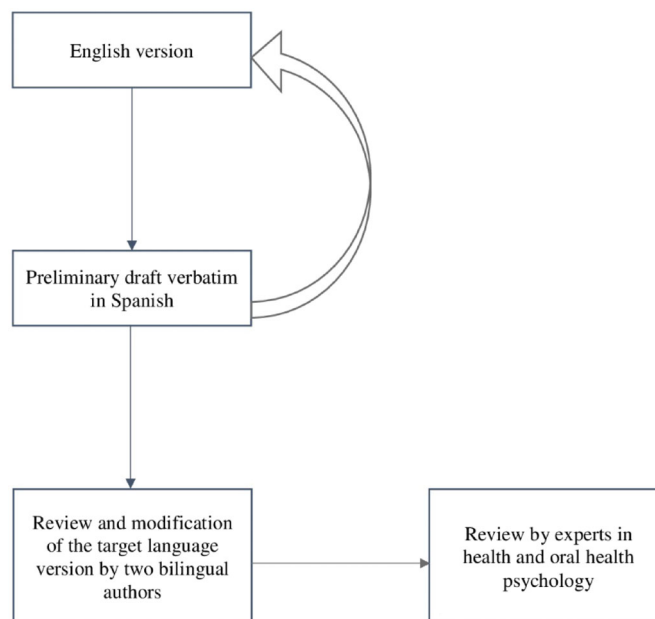


Figure 1. Translation and back-translation of OHSE.

introduced in other versions, such as the German one, in order to make the tool more widely used [24]. This gives 19 items divided into three factors (self-efficacy with brushing, self-efficacy with interdental cleanliness, and self-efficacy with dental visits). These questions were answered on a scale of 1–4 (1: 'not confident at all' to 4: 'completely confident'), resulting in scores between 19 and 79, with higher scores indicating greater self-efficacy (Figure 2). Previous studies in other samples, contexts and countries indicated that the instrument showed adequate psychometric properties although the methodologies of these studies were less than robust [4,14,24,26,27].

Procedure

Design

Participants were informed of the confidentiality of the data collected, the potential benefits to others and the absence of risk. The data were kept in the custody of one of the researchers and confidentiality was safeguarded at all times.

Data analysis

Data analysis was performed using the SPSS program version 26.0 for descriptive analysis and calculation of internal consistency, FACTOR software [30] for exploratory factorial analysis using the process recommended by Lloret-Segura et al. [31], structural equation modelling software (EQS, version 6.3) for Confirmatory Factorial Analysis (CFA) and Average Variance Extracted (AVE) and Microsoft Excel version 16.31 for calculating composite reliability.

The item properties were analyzed using item-total correlation coefficients and variations in the Cronbach's alpha coefficients of the items were eliminated. The psychometric properties of the questionnaire were tested with EFA and CFA. CFA was carried out to validate the factorial structure of the scales, using the Satorra–Bentler goodness-of-fit index

SCALE OF SELF-EFFICACY IN ORAL HYGIENE (OHSE)	SPANISH VERSION OF THE SELF-EFFICACY IN ORAL HYGIENE SCALE
Tooth brushing self-efficacy How confident are you, that you brush your teeth in the following situations: Item 1. When you are tired in the evening Item 2. When you are not going to a dentist in the near future Item 3. When you are on holiday Item 4. When you have a lot of work Item 5. When you have a headache Item 6. When you feel ill	Autoeficacia del cepillado dental ¿Cómo de seguro está de lavarse los dientes en estas situaciones?: Item 1. Cuando está cansado antes de acostarse Item 2. Cuando le falta mucho para ir al dentista Item 3. Cuando está de vacaciones Item 4. Cuando tiene mucho trabajo Item 5. Cuando tiene dolor de cabeza Item 6. Cuando se encuentra mal/enfermo
Approximal cleaning self-efficacy How confident are you, that you clean your proximal surfaces in the following situations? Item 7. When you are tired in the evening Item 8. When you are not going to the dentist in the near future Item 9. When you are on holiday Item 10. When you have a lot of work Item 11. When you have a headache Item 12. When you feel ill	Autoeficacia de la limpieza interdental ¿Cómo de seguro está de limpiarse bien las zonas de entre los dientes y muelas con el hilo dental o la seda dental en las siguientes situaciones? Item 7. Cuando está cansado antes de acostarse Item 8. Cuando le falta mucho para ir al dentista Item 9. Cuando está de vacaciones Item 10. Cuando tiene mucho trabajo Item 11. Cuando tiene dolor de cabeza Item 12. Cuando se encuentra mal/enfermo
Dental visiting self-efficacy How confident are you, that you visit the dentist as often as advised? Item 13. When a dentist does not invite you to visit regularly Item 14. When you have no dental symptoms Item 15. When you have money problems Item 16. When you are busy Item 17. When you are unable to make an appointment with a known dentist Item 18. When you have earlier unpleasant experiences Item 19. When you are frightened of painful interventions Woelber JP, Bienes H, Fabry G, Silbernagel W, Giesler M, Tennert C, Stamf S, Ratka-Kruger P, Hellwig E. Oral hygiene-related self-efficacy as a predictor of 6 oral hygiene behaviour: a prospective cohort study. J Clin Periodontol 2015; 42: 142–149. doi: 10.1111/jcpe.12348.	Autoeficacia de la visita al dentista ¿Cómo de seguro estás de ir al dentista cada 6 meses/ un año? Item 13. Cuando el dentista no le recuerda visitarlo regularmente Item 14. Cuando parece que no tiene problemas dentales porque no le duele nada Item 15. Cuando tiene problemas económicos Item 16. Cuando está ocupado Item 17. Cuando no puede concertar una cita con un dentista de confianza Item 18. Cuando ha tenido experiencias desagradables anteriores Item 19. Cuando tiene miedo de que la intervención sea dolorosa

Figure 2. English and Spanish version of the self-efficacy in oral hygiene scale (OHSE).

and the maximum likelihood estimation (MVR). The suitability of the CFA was confirmed by the significance of the chi-square and by the robust Satorra–Bentler correction ($S-B \chi^2$) [32].

Meanwhile, the goodness-of-fit of the models was demonstrated by the Comparative Fit Index (CFI) and the Incremental Fit Index (IFI) whose values ≥ 0.90 were considered adequate [33]. Finally, the root mean square error of approximation was calculated, the values of which had to be ≤ 0.08 [34].

Results

Analysis of items and reliability

The instrument comprised 19 items in three dimensions. After the analysis of the elements, the reliability analysis suggested eliminating items 1, 2 and 3 from the scale to increase the alpha of their respective factors (Table 1). All of the dimensions displayed acceptable coefficients.

Analysis of the validity of the instrument

After analyzing the psychometric properties of the items, the internal validity of the instrument was evaluated utilizing EFA and CFA. Prior to carrying out the EFA and CFA, the adequacy of the data was tested using the Kaiser–Meyer–Olkin (KMO) test and Bartlett’s test of sphericity. Both KMO (0.76), and Bartlett’s test of sphericity ($\chi^2 = 1655.90$; $df = 171$; $p \leq .001$) showed adequate coefficients, so EFA and CFA were carried out.

Table 1. Item analysis and reliability.

	M	SD	rx	$\alpha - x$	A	K
Brushing self-efficacy: $\alpha = 0.78$; α (without items 1, 2 and 4) = 0.79; FC = 0.84; CI = (0.75–0.83); AVE = 0.66						
OHSE1	3.09	1.03	0.40	0.79	–0.85	–1.96
OHSE 2	3.54	0.78	0.38	0.78	–1.90	3.22
OHSE3	3.48	0.81	0.52	0.76	–1.67	2.30
OHSE4	3.26	0.89	0.56	0.74	–1.08	0.35
OHSE5	2.73	0.77	0.69	0.72	–0.36	–0.13
OHSE6	2.84	1.01	0.69	0.71	–0.45	–0.90
Interdental self-efficacy: $\alpha = 0.91$; α (without items 7 and 8) = 0.90; FC = 0.91; CI = (0.75–0.82); AVE = 0.70						
OHSE7	1.98	0.96	0.72	0.89	–0.70	–0.49
OHSE8	2.59	1.06	0.60	0.91	–0.19	–1.19
OHSE9	2.33	1.23	0.73	0.89	0.20	–1.35
OHSE10	2.19	1.04	0.79	0.88	0.39	–1.03
OHSE11	1.20	0.96	0.79	0.88	0.62	–0.61
OHSE12	1.93	0.94	0.82	0.88	0.78	–0.30
Visits self-efficacy $\alpha = 0.80$; α (without item 19) = 0.80 FC = 0.82; CI = (0.75–0.82); AVE = 0.45						
OHSE12	2.88	0.99	0.37	0.80	–0.38	–0.96
OHSE13	2.54	1.01	0.47	0.78	0.04	–1.09
OHSE14	2.23	1.01	0.40	0.79	0.35	–0.96
OHSE15	2.34	0.97	0.47	0.78	0.26	–0.89
OHSE16	2.26	0.98	0.23	0.81	0.45	–0.76
OHSE17	2.67	1.00	0.40	0.80	–0.16	–1.05
OHSE18	2.81	0.93	0.54	0.80	–0.38	–0.73
OHSE total self-efficacy $\alpha = 0.86$; α (without items 1, 2, 4, 7, 8 and 19) = 0.83; FC = 0.94; CI = (0.75–0.82); AVE = 0.57						

Mean (M), standard deviation (SD), item-to-total correlation (rx), Cronbach’s alpha if the item is removed ($\alpha - x$), asymmetry (A), kurtosis (K), composite reliability (CF) and confidence interval for Cronbach’s alpha (CI), Index of extracted variance (suitable ≥ 0.40) (AVE).

Exploratory Factor Analysis (EFA). The EFA was calculated taking into account the original distribution of the items. According to the parallel analysis, the items were grouped in

Table 2. Confirmatory factor analysis of adjustment indicators for the initial and final three-factor solution.

Model	S-B- χ^2	df	<i>p</i>	S-B χ^2 /df	CFI	IFI	RMSEA
SEOH-19 items (3 factors for de initial structure)	485.502	149	<.001	3.26	0.84	0.84	0.10 (0.09–0.12)
SEOH-13 items (3 factors for the final structure)	144.137	62	<.001	2.32	0.96	0.96	0.07 (0.05–0.09)

S-B- χ^2 : Satorra–Bentler scaled (mean-adjusted) chi-square; df = degrees of freedom; S-B χ^2 /df = S-B ratio χ^2 & df; CFI: comparative fit index; IFI: Bollet Increment Adjustment Index; RMSEA: root mean square error of approximation.

Table 3. Reduced version of the SEOH scale with the selected items.

Reduced scale of the self-administered questionnaire of Scale of Self-Efficacy in Oral Hygiene (SEOH)	
Factor 1: Brushing self-efficacy	When you are on holiday (item 3) When you have a headache (item 5) When you feel ill (item 6)
Factor 2: Interdental self-efficacy	When you are on holiday (item 9) When you have a lot of work (item 10) When you have a headache (item 11) When you feel ill (item 12)
Factor 3: Visits self-efficacy	When a dentist does not invite you to visit regularly (item 13) When you have no dental symptoms (item 14) When you have money problems (item 15) When you are busy (item 16) When you are unable to make an appointment with a known dentist (item 17) When you have earlier unpleasant experiences (item 18)

three dimensions. After applying EFA to the three dimensions, item 2 and item 17 displayed a saturation of less than 40 in the indicated factors. However, without eliminating them, the factorial solution displayed a good index of fit (RMSEA = 0.05; CFI = 0.98). The variance explained by the three dimensions was 56.52%.

Confirmatory Factorial Analysis (CFA). After the EFA, CFA was carried out. The goodness-of-fit indicators for the three-factor solution in the 19-item version were inappropriate so those items that presented problems in the factor load were eliminated, those with scores ≤ 0.30 , enabling the model to improve significantly with the elimination of six items (items 1, 2, 4, 7, 8 and 19) (Table 2). The analysis was repeated after eliminating these six items, conserving the initial three-factor distribution, and in this case, adequate indicators of fit were displayed (Table 3).

The relationship between the different dimensions of the instrument was then analyzed using Pearson's correlations. Statistically significant, linear, positive and moderate relations were found between the dimensions. High self-efficacy with dental brushing is associated both with greater interdental self-efficacy and with attending odontological visits. Similarly, greater interdental self-efficacy is associated with increased perceived self-efficacy for visits to the odontologist.

Difference of means

To analyze differences in self-efficacy as a function of gender and age, the sample was divided into young adults (from 18 to 30 years old) and adults (over 30 years old). No difference was found between young adults and adults in brushing self-efficacy ($t_{353,795} = 1.66$, $p = .097$), interdental cleaning ($t_{358} = 1.68$, $p = .094$) or odontological visits ($t_{358} = 0.96$, $p = .339$). Furthermore, no statistically significant differences between men and women were found in brushing self-efficacy ($t_{358} = 0.10$, $p = .920$), or interdental cleaning ($t_{129} = 1.52$, $p = .129$) or dental visits ($t_{358} = 0.02$, $p = .981$).

Percentiles for interpreting self-efficacy in odontological patients

Finally, after completing the analysis of the psychometric properties of OHSE, a table of reference was prepared with standards to facilitate the interpretation of the data obtained in this study (Table 4).

Discussion

Reliable and valid instruments for evaluating oral self-efficacy are still unavailable in Spain even though they can influence behaviour, promote oral health and prevent risk behaviour [23].

After data analysis with robust methods, it was found necessary to eliminate some items (1, 2, 4, 7, 8 and 19), given that the indices of fit were not adequate. Subsequently, the reliability and validity of the questionnaire improved considerably. Therefore, the proposed version of the OHSE questionnaire is a reliable and valid instrument for the Spanish adult population.

The internal consistency results of the present study, which range from 0.79 to 0.90, are adequate and are similar to those found in previous studies with adults [14,24,26]. The study also offers a shortened version giving the opportunity of a rapid, reliable and valid evaluation for Spanish adults. On the other hand, the fit values obtained with EFA indicate that the proposed three-factor model seems to be a good fit, although some items had lower factorial loads than expected and have been eliminated by CFA, taking into account the values obtained.

Adapting this instrument to the Spanish context is an important innovation, as to date, there is no specific oral hygiene instrument in Spanish. Adapting an instrument to another language is a process that involves technical, linguistic and semantic aspects, which have been evaluated by the committee of experts from the area of health psychology and oral health, thus ensuring an instrument that is adapted to the Spanish context.

Table 4. Scale according to the years of the patients ($n = 360$).

Factor 1: Brushing self-efficacy			Factor 2: Interdental self-efficacy			Factor 3: Visits self-efficacy			Centil
18–30 years ($n = 174$)	31–75 years ($n = 186$)	Total	18–30 years ($n = 174$)	31–75 years ($n = 186$)	Total	18–30 years ($n = 174$)	31–75 years ($n = 186$)	Total	
12.00	12.00	12.00	13.00	14.00	13.00	25.00	24.00	25.00	90
11.00	11.00	11.00	11.00	12.00	12.00	22.00	21.00	21.00	80
10.00	10.00	10.00	10.00	10.00	10.00	20.00	20.00	20.00	70
10.00	10.00	10.00	9.00	10.00	9.00	19.00	19.00	19.00	60
10.00	10.00	10.00	8.00	8.00	8.00	17.00	17.00	17.00	50
9.00	9.00	9.00	7.00	8.00	8.00	16.00	16.00	16.00	40
8.00	7.00	8.00	5.00	6.00	6.00	15.00	15.00	15.00	30
7.00	7.00	7.00	4.00	5.00	4.00	14.00	13.00	14.00	20
7.00	6.00	6.00	4.00	4.00	4.00	13.00	11.00	12.00	10

On analyzing the influence of sociodemographic variables with respect to OHSE, age was not an important factor in previous studies [14,25], even including people ranging from 13 to 85 years old as in the research of Woelber et al. [24]. With respect to gender no conclusive data exists because while some authors do not find differences in gender [14], others report that women display higher oral self-efficacy scores [24,25]. Therefore, further study is necessary to look deeper into this question.

Despite making an important contribution, this research is not without limitations. The characteristics of the sample make generalizing the data to a normal population problematic, especially because of the sample size and the fact that participant selection was conducted randomly. In addition, while self-reporting is a common tool it can result in bias as a result of social convenience. In future research, a probabilistic sample should be used to expand the sample to other settings and even include patients with different oral disorders with the aim of being able to test the invariance of the instrument. In the same way, it is necessary to carry out studies that consider the concurrent and divergent validity of the instrument in greater depth, including biological markers such as the DMFT index (number of Decayed, Missing, and Filled Permanent Teeth) and CPI (Community Periodontal Index).

Nonetheless, this study contributes to knowledge of a fundamental variable in oral health, namely oral self-efficacy. Engaging in oral health at the level of self-efficacy permits better adherence to dental treatment, resulting in improved oral health for the patient and less public expenditure. However, more research is still required to evaluate the suitability of the method of intervention.

If low self-efficacy is identified early and odontologists together with other professionals such as psychologists can offer support to patients to improve their oral self-efficacy and they conduct regular follow-ups, cavities and tooth loss as a result of periodontal problems could be minimized [35].

Conclusions

In summary, the oral hygiene self-efficacy scale for a Spanish adult population has sufficient empirical support to be considered a valid and useful instrument. It has solid psychometric properties, which work effectively to evaluate the

perception of self-efficacy as a common behavioural factor. It can determine oral health behaviour and so offer an opportunity for oral health education intervention programs aimed at the adult population.

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Disclosure statement

The authors declare no conflict of interest.

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