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ORIGINAL ARTICLE

The reliability and validity of the Romanian rapid estimate of adult literacy in dentistry (RREALD-30)

R. Sfeatcu[a], S. A. Lie[b], C. Funieru[c], A. N. Åström[b] and J. I. Virtanen[b,d]

[a]Oral Health and Community Dentistry Department, Faculty of Dental Medicine, Carol Davila University, Bucharest, Romania; [b]Department of Clinical Dentistry, Faculty of Medicine, University of Bergen, Bergen, Norway; [c]Preventive Dentistry Department, Faculty of Dental Medicine, Carol Davila University, Bucharest, Romania; [d]Institute of Dentistry, University of Turku, Turku, Finland

ABSTRACT

Objectives: This study aimed to translate and adapt the Rapid Estimate of Adult Literacy in Dentistry (RREALD-30) instrument for Romanian urban adults and to test its reliability and validity for oral health literacy studies.

Material and methods: The study examined urban adult patients ($n = 224$) who attended the dental school clinic at the Faculty of Dental Medicine, Bucharest. We collected data through face-to-face interviews utilising the REALD-30 instrument. The interviews enquired about the Oral Health Impact Profile (OHIP-14), background characteristics, oral health-related knowledge, visits to dentists and self-rated oral health status. We applied principal component analysis for factor structure and Item Response Theory models to discriminate ability. A structural equation model (SEM) evaluated whether knowledge, perceived oral health, and visits to the dentist mediate the effect of RREALD on OHIP-14.

Results: Of the 224 participants, 113 (50.4%) were males. The internal consistency of the RREALD-30 measured by Cronbach's alpha was 0.88. The test-retest reliability was excellent (Spearman's correlation coefficient 0.98, ICC 0.90). RREALD-30 exhibited good concurrent and predictive validity. SEM demonstrated that RREALD mediated the effect of visits to dentist on OHIP-14.

Conclusion: The RREALD-30 proved satisfactory psychometric properties and may serve to evaluate dental health literacy among Romanian adults.

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Introduction

During the life course, health literacy skills enable individuals to take decisions concerning the management and prevention of diseases in order to achieve and maintain good health status and to improve quality of life [1]. Health literacy is important in medical and public health contexts; it is an important determinant of health at the individual and community level [2,3], and the World Health Organisation has prioritised its promotion [4]. As general health and oral health are closely related, methods for health literacy studies are also similar [5,6].

Individuals with a low level of health literacy lack medical and dental knowledge, and often have unhealthy behaviours and low compliance with treatment. This includes irregular medical visits or emergency visits, all resulting in poor health outcomes [7]. One's level of health literacy may interfere with one's ability to understand basic health information, to seek dental and medical care in early stages of disease, to communicate with health care providers, and to participate in shared medical or dental decision making [8].

Oral health literacy (OHL) plays an important role in addressing dental problems; people with a higher level of OHL, for example, tend to use more preventive dental care [9]. Identifying patients with inadequate OHL is crucial [9]. Oral health literacy is an important determinant of oral health status and a causal factor for oral health inequalities [6,10]. OHL encompasses cognitive, but also social skills to determine people's abilities to acquire, process and understand basic oral health data and medical services and to make appropriate oral health decisions regarding the prevention and management of oral diseases [10]. To improve dentist-patient communication and the quality of dental care, it is imperative to develop a health literacy-based practice in dentistry settings, as well as at the community level in order to minimise barriers to health care [11].

Researchers have developed OHL instruments using general health literacy tests as a template [12]. One common OHL tool is the Test of Functional Health Literacy in Dentistry (ToFHLiD) [13], developed from the Test of Functional Health Literacy in Adults (ToFHLA) [14]. However, this instrument has been recommended for wide use in public health practice and clinics [13,15]. Lee et al. [8] presented the first instrument for dental health literacy assessment, called the Rapid Estimation of Adult Literacy in Dentistry (REALD) [8,16]. The design of the Rapid Estimation of Adult Literacy in Medicine (REALM) served as the basis for the REALD-30 and REALD-99, two word-recognition tests,

CONTACT C. Funieru thycristi@yahoo.com Preventive Dentistry Department, Faculty of Dental Medicine, Carol Davila University, Bucharest, Romania
Supplemental data for this article can be accessed here.

containing common terms used in dental settings [17]. Both instruments test an individual's ability to read and pronounce dental words, but the long form with 99 words extends the application time and adds little to the results, so thus use of the short form is preferable [12]. The REALD-30 is easy to apply in dental offices and public health settings and takes little time (3–5 min).

Researchers have tested the REALD-30 for its psychometric properties in various populations (university patients, private clinics, and low-income populations), and a review showed that those with a reduced OHL level have poor oral health knowledge and unhealthy behaviour [12]. Moreover, evidence suggests that the REALD-30 score correlates with perceived dental health status and oral health-related quality of life measured by the Oral Health Impact Profile (OHIP-14) [5,18].

A number of studies have confirmed that health literacy associates with health and oral health outcomes [9,10,19–22], and that this association is explained, at least in part, by concepts adopted from cognitive theories, such as knowledge, attitudes, self-efficacy and behaviours [23]. Evidence of such relationships is based mainly on multiple regression models and, to a lesser extent, on structural equation modelling (SEM). This is noteworthy considering that SEM has advantages over conventional regression analyses, allowing for the separation of effects into direct and indirect ones and the assessment of all relationships in the conceptual models in a single analysis.

Brega et al. [23] developed a conceptual model suggesting that limited oral health literacy leads to lack of knowledge and negative oral health attitudes and that poor knowledge and negative attitudes may serve as barriers to recommended oral health-promoting behaviours and, in turn, to poor oral health outcomes. Consistent with a slightly modified version of this model, we hypothesised that poor oral health literacy assessed by the REALD-30 would associate with reduced oral health-related quality of life assessed by OHIP–14, and that poor knowledge, poor oral health perceptions, and restricted use of regular dental care would mediate or explain this association. We also hypothesised that poor oral literacy assessed by the REALD 30 would associate with poor oral knowledge, negative oral attitudes and restricted use of dental care and, in turn, that poor oral knowledge, negative oral attitudes and restricted use of dental care would associate with lower oral health-related quality of life. The OHIP-14 scale is a tool frequently used to assess the impact of oral health on quality of life. This inventory has been translated to Romanian and validated in the Romanian context [24].

To date, no valid instruments are available to assess general health literacy or OHL in Romanian adults, as REALD-30 remains unvalidated in the Romanian context. Studies are therefore needed to examine whether the concept of oral literacy is valid in the Romanian context [20,25]. As the essence of construct validity depends on theory, estimation of the associations in the proposed conceptual model is as much a test of the conceptual model itself as it is a test of the validity of its constructs.

A 2015 study of health literacy in the European Union showed that in Romania, the term 'health literacy' is uncommon; rather, its use is related to broader concepts in public health and patient health education [25]. Furthermore, national health policies indirectly address health literacy, with all aiming to promote health and to improve public health education and communication between professionals and patients. OHL is a neglected area in Romania, and more efforts ought focus on identifying individuals with low and moderate health literacy levels and addressing their needs [25]. One study assessed the level of health literacy among rural adults in Romania, but the instrument remains unvalidated [20].

Thus, our study aimed mainly to translate the Rapid Estimate of Adult Literacy in Dentistry (REALD-30) into Romanian and to test its validity and reliability in the context of urban Romanian adults. We also aimed to test its reliability and validity for future oral health literacy studies among adults in Romania, and its effect on OHIP-14.

Material and methods

This study took place in two phases: first, the translation and cultural adaptation of the English version of the REALD-30 into the Romanian language and, second, evaluation of the translated health literacy tool's psychometric properties according to Streiner and Norman protocol [26] as well as its effect. The Ethics Committee of the Carol Davila University of Medicine and Pharmacy approved the study (Nr: 54/29.03.2015). Participation was voluntary, and all participants provided their written consent.

Study population

The study examined urban adult patients who attended the dental school clinic at the Oral Health and Community Dentistry Department and the Preventive Dentistry Department at the Carol Davila University of Medicine and Pharmacy, Faculty of Dental Medicine, Bucharest. We collected the sample during 12 months (October 2016 – September 2017). After providing information about the study and confidentiality, we included in the study all those who agreed to participate. Of the 255 patients invited, 224 patients participated in the study (participation rate: 87.8%). The inclusion criteria for the study were: the ability to write and read the Romanian language, a minimum age of 18 years, residency from urban areas, no uncorrected visual and hearing impairments, and a willingness to participate.

Romanian translation

Two Romanian dentists fluent in English agreed to translate the English version of the REALD-30 into Romanian. A native English speaker who had studied and lived in Romania for 10 years then backtranslated the REALD-30 into English. Two dentists and one sociologist (all Romanian native speakers) and the English native speaker agreed on the first Romanian version of the REALD-30. The Romanian version uses four

compound words (for floss, braces, plaque and apicoectomy) that are commonly used in current dental practice in Romania. A convenience sample of 20 adult patients with different levels of education pilot tested this version, by visiting the dental school clinic to assess its sensitivity to the local culture and its operational characteristics (instructions, administration time, and response evaluation time: correct pronunciation, hesitation, repetition or pause) and then assessing its psychometric properties [8]. All changes were made accordingly, resulting in the final form of the RREALD-30.

Instruments used

We used the REALD-30 instrument to collect data in face-to-face interviews to evaluate oral health literacy. We enquired about the oral health-related quality of life measured by the OHIP-14 [5,8,18,24], background characteristics (age, gender, years of education, and dental visiting habits), self-rated oral health status (recorded on a five-point Likert scale: excellent, very good, good, fair, and poor) [6,8]. Oral health knowledge was assessed with questions about the causes of dental caries and gum diseases.

For the REALD-30, two researchers (RS, CF) asked the subjects to read the word list aloud; we calculated the overall score as the sum of all correctly pronounced words, with each correctly pronounced word scoring one point. The total scores ranged from 0 (lowest) to 30 points (highest level of oral health literacy).

The OHIP-14 is a scale used to evaluate oral health-related quality of life (OHRQoL) based on problems with the teeth and mouth in the last month. It is the main scale used to assess the relationship between the oral health status and the quality of life, and measures the impact of oral condition: functional limitation, physical pain and disability, psychological discomfort and disability, social disability, and handicap [24]. The answers were marked on a five-point Likert scale as follows: 'very often' = 4, 'fairly often' = 3, 'occasionally' = 2, 'hardly ever' = 1, and 'never/I don't know' = 0. We then added up the scores, and the total scores ranged from 0 to 56 [24]. A lower score on the OHIP-14 indicates higher OHRQoL.

Statistical analyses

Cross-tabulation served to describe the basic background characteristics of the participants by gender. In the cross-tabulation, the chi-square test served to evaluate the statistical significance of the differences between males and females.

We assessed two types of reliability: test-retest and internal consistency. Cronbach's alpha served to measure the internal consistency of the items in the RREALD-30 total score. To evaluate the test-retest (or intra-rater) performance, 20 subjects read the words twice. The interval between the scoring sessions was two weeks. Calculating the intra-class correlation coefficient (ICC) in a mixed effects model determined the test-retest reliability. Furthermore, Spearman's correlation coefficient served to estimate the test-retest reliability of the sum scores of the test and re-test.

REALD is designed for one dimension or factor. Principal component analysis (PCA) served to determine whether the factor structure of the RREALD-30 follows the anticipated one-factor solution. For this, we examined the eigenvalues, the fraction of the first and second eigenvalues, and the scree plot (Supplementary Appendices 1 and 2). Assuming a one-factor solution, we used Item Response Theory (IRT) models [27] to determine the discriminating ability for each of the items of the RREALD-30. The IRT (Rasch model) analyses the probability to correctly read each of the words in RREALD-30, assuming the validity of a one-factor PCA.

Lastly, we applied the sum score of the RREALD-30 (assuming a one-factor structure) in a structural equation model (SEM) to analyse, in a theoretical framework, how knowledge, perceived oral health, and visits to the dentist mediate the effect of RREALD on OHIP-14. We included age and education as confounding (background) factors in the model. The Root Mean Square Error of Approximation (RMSEA) is related to the residual error in the model. RMSEA values range from 0 to 1, with a smaller RMSEA value indicating a better model fit, and an RMSEA value of 0.06 or less indicating an acceptable model fit [28].

The Chi-square, Kruskal–Wallis and Mann–Whitney tests served to evaluate the statistical significance of differences in the total sum REALD scores between different sub-groups. We used IBM SPSS Statistics, version 25, Armonk, NY: IBM Corp. software to perform the descriptive analyses. We applied the mirt (REF) and the lavaan (REF) packages in the statistical program 'R for Windows' to analyse the PCA analysis, the IRT analysis and the SEM model. *p*-Values less than .05 indicated statisticaly significance. Lavaan served for the EFA (using PCA loadings).

Results

The study participants comprised 224 healthy adults with Romanian as their first language. Table 1 shows the distributions of participants' basic characteristics by gender. Of the 224 participants, 113 (50.4%) were males and 111 (49.6%) were females. In terms of education level, most of the subjects (77.2%) had more than 12 years of education.

Significantly more women than men self-assessed their socio-economic status and education level as high, with a regular visit to the dentist every 6 months ($p < .05$) (Table 1). More females than males enjoy better oral health status ($\geq$20 natural teeth or no dentures) ($p > .05$). More males than females self assessed their socio-economic status (SES) as medium (58.4% vs 49.5% females) and low (11.5% vs 2.7%), while more women than men rated their SES as high (45.9% vs. 30.1% males) ($p = .003$). Most of the participants, and especially men, reported visiting the dentist only when experiencing pain. More females than men visited the dental office every 6 months ($p = .001$). The higher the OHIP-14 scores, the lower the quality of life. The men had higher OHIP-14 scores than the women had ($p < .001$). For instance, 40.7% of the men had a sum score over 15, while the

Table 1. Basic characteristics of the Romanian participants by their background, oral health and habits.

Variable	Male *n* (%)	Female *n* (%)	All *n* (%)	*p*-Value[a]
Age				<.001
• 18–30 years	43 (38.1)	71 (64.0)	114 (50.9)	
• 31–50 years	47 (41.6)	37 (33.3)	84 (37.5)	
• ≥51 years	23 (20.4)	3 (2.7)	26 (11.6)	
Education				.003
• ≤8 years	10 (8.8)	0 (0.0)	10 (4.5)	
• 9–12 years	17 (15.0)	24 (21.6)	41 (18.3)	
• >12 years	86 (76.1)	87 (78.4)	173 (77.2)	
SES				.003
• Low	13 (11.5)	3 (2.7)	16 (7.1)	
• Medium	66 (58.4)	55 (49.5)	121 (54)	
• High	34 (30.1)	51 (45.9)	85 (37.9)	
Natural teeth				.420
• 0–9 teeth	5 (4.4)	3 (2.7)	8 (3.6)	
• 10–19 teeth	23 (20.4)	16 (14.4)	39 (17.4)	
• 20 teeth	85 (75.2)	92 (82.9)	177 (79)	
Denture wearing				.078
• yes	17 (15)	9 (8.1)	26 (11.6)	
• no	96 (85)	102 (91.9)	198 (88.4)	
Reason for visiting dentist				.005
• Emergency	59 (52.2)	38 (34.2)	97 (43.3)	
• Control/treatment	54 (47.8)	73 (65.8)	127 (56.7)	
Frequency of visiting dentist				.001
• 6 months	34 (30.1)	50 (45)	84 (37.5)	
• Pain/problems	67 (59.3)	60 (54.1)	127 (56.7)	
• Never	12 (10.6)	1 (0.9)	13 (5.8)	
OHIP-14				< .001
• ≤5	47 (41.6)	40 (36.0)	87 (38.8)	
• >5–≤15	20 (17.7)	46 (41.4)	66 (29.5)	
• >15	46 (40.7)	25 (22.5)	71 (31.7)	

[a]Chi-square test.

Table 2. IRT analysis (Rasch-model) of RREALD-30.

	Item mean	Outfit MNSQ	Outfit ZSTD	Infit MNSQ	Infit ZSTD
Hypoplasia	0.55	0.46	−4.73	0.56	−5.96
Malocclusion	0.55	0.56	−3.64	0.67	−4.26
Temporomandibular	0.65	0.64	−2.83	0.69	−3.76
Periodontal	0.67	0.41	−4.96	0.57	−5.58
Bruxism	0.71	0.80	−1.26	0.86	−1.58
Incipient	0.77	0.46	−3.12	0.70	−3.43
Braces	0.78	0.48	−2.84	0.75	−2.79
Halitosis	0.78	1.13	0.63	0.97	−0.28
Fistula	0.78	1.45	1.82	1.58	5.08
Analgesia	0.79	1.04	0.23	1.22	2.04
Extraction	0.82	0.40	−2.85	0.76	−2.45
Apicoectomy	0.82	0.64	−1.46	1.00	0.03
Restoration	0.82	0.35	−3.15	0.67	−3.47
Plaque	0.85	0.42	−2.25	0.83	−1.45
Hyperemia	0.88	1.03	0.22	1.30	2.01
Floss	0.89	0.50	−1.34	0.79	−1.46
Pulp	0.90	1.33	0.82	1.36	2.18
Genetics	0.93	0.47	−1.00	0.85	−0.76
Abscess	0.96	0.33	−0.95	0.82	−0.64
Sealant	0.96	0.24	−1.21	0.87	−0.36
Fluoride	0.97	2.29	1.53	0.95	−0.05
Cellulitis	0.98	1.63	0.99	0.89	−0.18
Sugar	1.00	0.18	−1.74	0.72	−0.26
Enamel	1.00	0.02	−3.13	0.43	−0.92
Caries	1.00	0.50	−0.73	0.74	−0.22
Smoking	1	–	–	–	–
Brush	1	–	–	–	–
Denture	1	–	–	–	–
Dentition	1	–	–	–	–
Gingiva	1	–	–	–	–

corresponding figure among women was 22.5% (Table 1). Men perceived their oral health quality of life as lower, since the higher the average value of the seven dimensions, the more negative the impact of oral health on an individual's quality of life. Cronbach's alpha measured the internal consistency and reliability of the REALD-30 Romanian version as 0.88. We excluded from the analysis of internal consistency items that all participants read correctly (items number 2, 4, 13, 15, and 17). The test-retest reliability was excellent, with identical mean scores for the first and second measurements (Spearman's correlation coefficient = 0.98, intra-class correlation coefficient = 0.90).

The PCA analysis demonstrated that the present data for RREALD-30 had a one-factor solution based on the scree-plot and eigenvalues (Supplementary Appendix 1). RREALD items 2, 4, 13, 15, and 17 showed zero variation (all individuals read these words correctly). Factor loadings appear in the supplementary table (Supplementary Appendix 2).

For the IRT analysis, we omitted items with zero variation. The IRT model showed a discriminating ability for each word in the RREALD-30 (Table 2).

The RREALD-30 scores were significantly higher among females than among males. More females achieved the maximum RREALD-30 score, while males dominated the lower health literacy scores. Table 3 shows the means, median values and quartiles of the total score by various sub-groups of the participants. Females with more education and those who regularly visit the dentist achieved significantly higher RREALD-30 scores than did participants with eight or less years of education and those who usually visited a dentist because of a problem (problem-based dental attenders) ($p < .001$). The level of literacy tends to decrease with age, but the differences were not statistically significant. Subjects with poor oral health status and those who visited the dentist during an emergency have lower RREALD-30 scores, namely, low health literacy in dentistry.

The RREALD-30 associated with self-perceived oral health: subjects with higher RREALD-30 scores reported better oral health (see Table 3).

The RREALD-30 had a statistically significant effect on OHIP-14 ($p = .004$). Including visits to the dentist as a mediating factor in the SEM model yielded an indirect effect ($p = .002$) of RREALD-30 on OHIP-14. Figure 1 shows a model for RREALD-30 and OHIP-14 with the background factors based on a theoretical oral health model. Table 4 shows the mediating effects of the included variables. We found the theoretical SEM model to fit the given data well (AIC = 3443.97, BIC = 3532.67, RMSEA = 0).

Discussion

To our knowledge, this is the first study to introduce and evaluate the psychometric properties of an oral health literacy tool for the Romanian population. The RREALD-30 demonstrated excellent internal consistency and reliability in repeated administrations.

Our study showed strong correlations in RREALD-30 validation in the Romanian language: gender, education, and charcteristics related to dental visits. RREALD-30 scores related to educational status, and therefore exhibited good

Table 3. RREALD-30 score of the participants by their background.

Subgroups	*n*	Mean	SD	Median	Quartiles (Q1, Q3)	*p*-Value[a]
Gender						<.001
• Male	113	24.7	4.6	25.0	(22, 29)	
• Female	111	27.0	4.0	29.0	(25, 30)	
Age						.141
• 18–30 years	114	26.5	3.7	27.5	(24, 30)	
• 31–50 years	84	25.5	4.4	26.5	(22, 30)	
• ≥51 years	26	23.8	6.7	26.0	(19, 30)	
Education						<.001
• ≤8 years	10	18.1	5.0	17.0	(14, 21)	
• 9–12 years	41	25.2	5.0	27.0	(21.5, 30)	
• >12 years	173	26.4	3.9	27.0	(23.5, 30)	
Natural teeth						.049
• 0–9 teeth	8	22.8	7.4	24.0	(16.75,29.5)	
• 10–19 teeth	39	24.4	5.1	25.0	(20, 29)	
• 20 teeth	177	26.3	4.1	28.0	(23, 30)	
Denture wearing						.039
• yes	26	23.1	6.7	24.5	(17, 29.0)	
• no	198	26.2	3.9	27.0	(23, 30)	
Reason for visiting dentist						.002
• emergency	97	24.8	4.6	25.0	(22, 29)	
• control/treatment	127	26.6	4.2	28.0	(24, 30)	
Frequency of visiting dentist						<.001
• 6 months	84	27.1	3.8	29.0	(25, 30)	
• pain/problems	127	25.7	3.9	27.0	(23, 30)	
• never	13	18.7	6.2	17.0	(14, 24.5)	
Self–rated oral health						<.001
• excellent	17	26.7	4.5	28.0	(26, 30)	
• very good	64	27.6	3.6	30.0	(25.5, 30)	
• good	103	25.2	4.4	26.0	(21, 29)	
• satisfying	31	24.7	4.3	26.0	(22, 29)	
• poor	9	22.4	6.6	24.0	(18.5, 27.5)	

[a]Kruskal–Wallis or Mann–Whitney test.

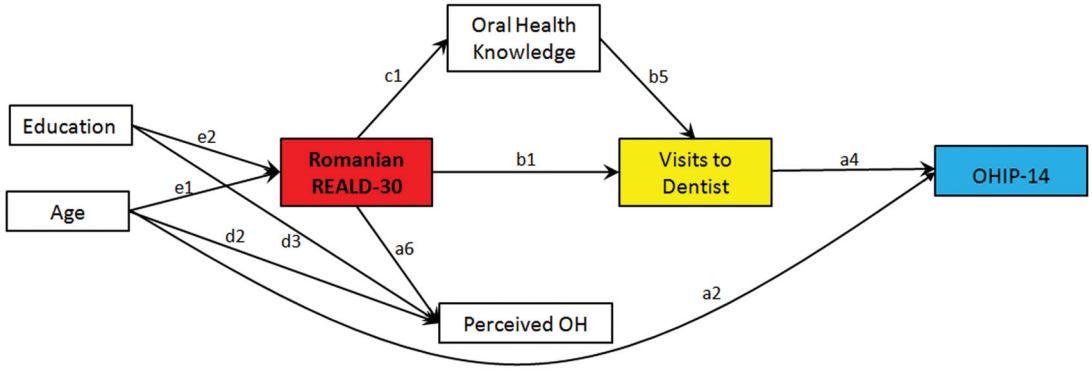

Figure 1. Structural equation model for RREALD-30 and OHIP-14 with the background factors based on theoretical oral health model.

concurrent validity, with subjects with greater educational attainment reporting higher literacy scores [5,7,8,29].

The English REALD-30 has been validated into Turkish [10], Portuguese [19], Arabic [5], Spanish [30], Chinese [31], and Indian [18], and validated among Spanish speakers in the USA and in Chile [32].

Cronbach's alpha values > 0.70 and item-total correlation coefficients > 0.20 are generally considered acceptable [10,33]. The internal consistency of the Romanian word recognition instrument was good, with a Cronbach's alpha of 0.88, in line with results from previous studies: 0.87 [8], 0.91 [5], and 0.88 [19].

The ICC used to examine the test-retest reliability was 0.95, indicating excellent agreement between the repeated administrations, similar to other studies: 0.78 [31], 0.98 [19], and 0.99 [5,10].

We found that participants found some words in the RREALD-30 easier to understand and pronounce than others; for example, participants understood words like 'smoking', 'brush', 'denture', 'dentition' and 'gingiva' correctly in all cases. These eight items, including, for example, 'caries', are common words people use in everyday conversations. On the other hand, words like 'bruxism', 'hypoplasia' or 'malocclusion' are dental terms typically used by oral health professionals in their occupation. The ten most challenging words for the Romanians to understand and pronounce were largely in line with the findings from the Turkish, Brasilian and Arabic REALD studies [5,10,19]. 'Extraction' and 'Incipient' were especially difficult items for the Romanians to understand and pronounce. In contrast to previous studies [10,19], some items ('Fluoride', 'Sealant', 'Cellulitis') were not among the difficult words, probably because of their

Table 4. Estimated coefficients for a SEM-model showing the mediating effect between the included variables.

	SEM (full model)			SEM (without knowledge)		
	Estimate	95%CI	*p*-Value	Estimate	95%CI	*p*-Value
OHIP						
REALD (a1)	−0.108	(−0.396–0.180)	.464			
Age (a2)	0.186	(0.086–0.286)	.000	0.209	(0.115–0.303)	.000
Education (a3)	1.887	(−1.427–5.201)	.264			
Visits (a4)	5.937	(2.985–8.889)	.000	6.812	(4.572–9.052)	.000
Knowledge (a5)	0.235	(−2.262–2.732)	.853			
Perceived OH (a6)	1.327	(−0.437–3.091)	.141			
Visits						
REALD (b1)	−0.015	(−0.029–0.001)	.028	−0.013	(−0.025–0.001)	.041
Age (b2)	−0.002	(−0.006–0.002)	.424			
Education (b3)	−0.078	(−0.219–0.063)	.281			
Knowledge (b4)	0.078	(−0.049–0.205)	.236			
Perceived OH (b5)	0.212	(0.147–0.277)	.000	0.216	(0.153–0.279)	.000
Knowledge						
REALD (c1)	0.034	(0.020–0.048)	.000			
Age (c2)	0.002	(−0.002–0.006)	.507			
Education (c3)	−0.024	(−0.173–0.125)	.752			
Perceived OH						
REALD (d1)	−0.026	(−0.053–0.001)	.071	−0.026	(−0.053–0.001)	.073
Age (d2)	0.016	(0.006–0.026)	.001	0.016	(0.006–0.026)	.001
Education (d3)	−0.558	(−0.778–0.338)	.000	−0.558	(−0.783–0.333	.000
REALD						
Age (e1)	−0.094	(−0.149–0.039)	.001	−0.094	(−0.151–0.037)	.001
Education (e2)	1.968	(0.512–3.424)	.008	1.968	(0.441–3.495)	.012
Indirect effects						
(b1 x a4)	−0.089	(−0.179–0.001)	.053	−0.085	(−0.173–0.003)	.059
(d1 x a6)	−0.034	(−0.095–0.027)	.280			
(c1 x a5)	0.008	(−0.080–0.096)	.860			
(c1 x b4 x a4)	0.016	(−0.011–0.043)	.259			
(d1 x b5 x a4)	−0.032	(−0.071–0.007)	.103	−0.038	(−0.081–0.005)	.082

association with general contexts frequently encountered in individuals' daily lives.

We hypothesizsed along with Brega et al. [23] that poor oral health literacy would associate with lower oral health-related quality of life assessed by OHIP–14. This hypothesis proved to be true in our Romanian study population, with the association partly explained, but not mediated, by poor oral knowledge. While some studies have found no significant association between OHL and dental utilisation [9], our study found that visits to dentists significantly mediated the effect of RREALD-30 on oral health-related quality of life. In addition, the participants' age directly affected their quality of life, possibly due to huge cultural changes in Romanian society in recent years [20,25].

The REALD-30 has adequate psychometric properties, though some criticise the recognition and/or pronunciation of some of words [6,32]. This aspect was also evident in our study. One's level of health literacy in dentistry is linked to two dental outcome measures: self-reported oral health status [8,10,19,34,35] and oral health-related quality of life [8,10].

Socioeconomic conditions are also risks factors for oral health status and are difficult to modify to develop strong oral health strategies. Fortunately, OHL is modifiable, and this feature can lead to efficient approaches in the prevention of oral diseases [36].

The OHIP-14 instrument found that Romanian men considered the impact of oral health on their quality of life more negatively than women did.

A word recognition instrument could serve as an easy and rapid health literacy tool for assessing reading ability of patients in medical care settings. The RREALD-30 proved to have satisfactory psychometric properties and could be appropriate for evaluating dental health literacy among adults who speak Romanian and live in urban areas. The limitations of the test include its lack of comprehension part (i.e. an individual who is able to pronounce a medical word may not know its meaning) and its inability to assess people with difficulties speaking or those who, due to embarrassment, avoid reading the words aloud in front of an interviewer or dentist.

The present study also has some limitations. One limitation was the study's small sample size, recruited from one dental university clinic in Bucharest, the capital of Romania. The subjects may represent a more highly educated group, which reduces generalisation of the results to the rest of the country. The REALD-30 is a limited dental health literacy test of reading ability through assessments of word recognition in dentistry, whereas a general reading comprehension test may better serve clinical and research needs. In addition, we could not assess the convergent validity of the RREALD-30, since to date, no general health literacy test validated for the Romanian language is available. Further, the present study did not assess the participants' oral clinical status, which is an ideal outcome measure for the instrument's predictive validity. Further studies of larger and more diverse populations are recommended to generalise the RREALD-30 to the Romanian people.

Conclusions

RREALD-30 exhibited excellent internal consistency and reliability. RREALD-30 exhibited good concurrent and predictive

validity RREALD-30 proved to have satisfactory psychometric properties and may serve to evaluate dental health literacy among Romanian adults.

Disclosure statement

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