Evaluation of a Word Recognition Instrument to Test Health Literacy in Dentistry: The REALD-99

Julia A. Richman, DDS; Jessica Y. Lee, DDS, MPH, PhD; R. Gary Rozier, DDS, MPH; Debra A. Gong, DDS, MA; Bhavna T. Pahel, BDS, MPH; William F. Vann, Jr., DMD, PhD

Abstract

Objective: *This study aims to evaluate a dental health literacy word recognition instrument.* ***Methods:*** *Based on a reading recognition test used in medicine, the Rapid Estimate of Adult Literacy in Medicine (REALM), we developed the Rapid Estimate of Adult Literacy in Dentistry (REALD-99). Parents of pediatric dental patients were recruited from local dental clinics and asked to read aloud words in both REALM and REALD-99. REALD-99 scores had a possible range of 0 (low literacy) to 99 (high literacy); REALM scores ranged from 0 to 66. Outcome measures included parents' perceived oral health for themselves and of their children, and oral health-related quality of life of the parent as measured by the short-form Oral Health Impact Profile (OHIP-14). To determine the validity, we tested bivariate correlations between REALM and REALD-99, REALM and perceived dental outcomes, and REALD-99 and perceived dental outcomes. We used ordinary least squares regression and logit models to further examine the relationship between REALD-99 and dental outcomes. We determined internal reliability using Cronbach's alpha.* ***Results:*** *One hundred two parents of children were interviewed. The average REALD-99 and REALM-66 scores were high (84 and 62, respectively). REALD-99 was positively correlated with REALM (PCC = 0.80). REALM was not related to dental outcomes. REALD-99 was associated with parents' OHIP-14 score in multivariate analysis. REALD-99 had good reliability (Cronbach's alpha = 0.86).* ***Conclusions:*** *REALD-99 has promise for measuring dental health literacy because it demonstrated good reliability and is quick and easy to administer. Additional studies are needed to examine the validity of REALD-99 using objective clinical oral health measures and more proximal outcomes such as behavior and compliance to specific health instructions.*

Key Words: health literacy, REALM, REALD, dental health literacy

Introduction

The 1992 National Adult Literacy Survey estimates that 40 to 44 million (21 to 23 percent) adult Americans lack functional literacy, and another 50 million (25 to 28 percent) have limited literacy skills (1). A follow-up survey by the National Center for Education Statistics found little change in the intervening decade in adults' ability to read and understand sentences and paragraphs or to understand documents such as job applications. Individuals from low-income groups and those with less education often lack skills to ask for and obtain information about preventive health services or available treatment options (2). It is important that health care providers identify patients with low literacy skills and help them understand information given in the health care setting. Although literacy has the most direct effects on reading ability, low literacy may predispose patients to misunderstand verbal instructions from a health care provider, especially instructions that include medical terminology.

The medical instrument Rapid Estimate of Adult Literacy in Medicine (REALM) is a reading recognition literacy screening instrument used widely in health services research. REALM was first introduced in 1991 by Davis and colleagues (3) and later shortened to a list of 66 health-related words that subjects read aloud (4). REALM has been used in studies linking low health literacy to unhealthy behaviors and poorer health outcomes. As examples, patients with low literacy were found to underutilize important preventive services such as mammography (5) and gonorrhea screening (6). They also have been found to have less knowledge of the purpose of cervical cancer screening exams (7) or the risks inherent with smoking while pregnant (8), and to be more likely to be diagnosed with late-stage prostate cancer (9). These studies strongly support the conclusion that low health literacy is corre-

Send correspondence and reprint requests to Jessica Y. Lee, DDS, MPH, PhD, Department of Pediatric Dentistry CB 7450, University of North Carolina, Chapel Hill, NC 27599-7450. Tel.: 919-966-2739; Fax: 919-966-7992; e-mail: leej@dentistry.unc.edu. Julia A. Richman is with the School of Dentistry, University of Washington. Jessica Y. Lee is with the Departments of Pediatric Dentistry and Health Policy and Administration, University of North Carolina at Chapel Hill, Chapel Hill, NC. R. Gary Rozier and Bhavna T. Pahel are with the Department of Health Policy and Administration, University of North Carolina at Chapel Hill, Chapel Hill, NC. Debra A. Gong is with the Veteran's Administration Hospital, University of Illinois in Chicago. William F. Vann, Jr. is with the Department of Pediatric Dentistry, University of North Carolina at Chapel Hill, Chapel Hill, NC. This research was conducted with the support of the UNC Short-Term Research Fellowship, NIDCR Grant #1K22DE14743, and MCHB #5T17MC00015-140. Abstract presented as a poster, March 2005 at the IADR/AADR/CADR 83rd General Session and Exhibition. Manuscript received: 4/12/06; accepted for publication: 1/27/07.

DOI: 10.1111/j.0022-4006.2007.00022.x

lated with a lack of knowledge of health and disease, unhealthy behaviors, and ultimately with poorer health outcomes.

Health Literacy in Dentistry. Although evidence from research in medical settings highlights the importance of literacy for patient knowledge and positive health behaviors and outcomes, patient literacy has received little attention in dentistry. Studies in the United States are limited to those assessing the reading level of patient educational materials and postoperative instructions (10,11) and patient understanding of verbal informed consent information (12). In general, these studies have found that many dental instructions and brochures have a level of sophistication beyond the average patient's reading ability and often contain jargon, making them difficult to understand (13).

Our initial investigations in developing a dental health literacy reading recognition instrument yielded an instrument, the Rapid Estimate of Adult Literacy in Dentistry (REALD-30), with a list of 30 common dental words having various degrees of difficulty (14). It was tested among 202 English-speaking adults recruited from outpatient medical clinics. REALD-30 proved to have good internal reliability (Cronbach's alpha = 0.87) and convergent validity, determined by its correlation with REALM. It also was correlated with oral health quality of life, but not self-perceived oral health status, providing mixed results for predictive validity. The instrument also was not unidimensional, rather it appeared to have two dominant factors.

Research reported in this article builds on our previous work in developing a word recognition instrument for use in dentistry. The purpose of this study is to develop and validate a longer version of a reading recognition dental health literacy instrument. We hypothesized that a longer version of REALD, REALD-99, would perform better than REALD-30. We reasoned that a longer list of words would represent more components of dental health and thus provide a better chance of accurately measuring dental literacy. We further reasoned that a larger number of words would allow us to provide a thorough test of its psychometric properties. We also expanded on our previous work by considering the oral health of children in addition to that of their parents. This approach would allow for additional hypothesis testing for instrument validity.

To this aim, we developed and pilot tested the **R**apid **E**stimate of **A**dult **L**iteracy in **D**entistry **(REALD-99)**. We tested the validity of REALD-99 by examining the relationship between dental health literacy measured word recognition (REALD-99) and self-reported oral health outcomes measures (dental health status and oral health quality of life).

Table 1
REALD-99 Instrument

Column 1	Column 2	Column 3	Column 4
1. Bite	26. Approval	51. Veneer	76. Malignant
2. Sugar*	27. Pulp*	52. Panoramic	77. Esthetic
3. Smoking*	28. Mouth rinse	53. Orthodontics	78. Diagnosis
4. Tooth	29. Splint	54. Instrument	79. Abscess*
5. Floss*	30. Toothpaste	55. Nutrition	80. Incipient*
6. Habits	31. Mouth guard	56. Inflammation	81. Halitosis*
7. Brush*	32. Denture*	57. Restoration*	82. Calculus
8. Diet	33. Fracture	58. Fluoride*	83. Avulsion
9. Dentist	34. Enamel*	59. Bacteria	84. Malocclusion*
10. Canine	35. Erupt	60. Evaluation	85. Incisor
11. Socket	36. Tongue	61. Plaque*	86. Transmissibility
12. Molar	37. Sealant*	62. Biopsy	87. Microorganisms
13. Oral	38. Genetics*	63. Sterilization	88. Gingiva*
14. Filling	39. Varnish	64. Prescription	89. Ankylosis
15. Bleeding	40. Referral	65. Suture	90. Dentition*
16. Snacking	41. Copayment	66. Radiograph	91. Bruxism*
17. Bridge	42. Coverage	67. Trauma	92. Hyperemia*
18. Cavity	43. Surgery	68. Extraction*	93. Analgesia*
19. Recall	44. Sedation	69. Operative	94. Amalgam
20. Implant	45. Deductible	70. Porcelain	95. Hypoplasia*
21. Cancer	46. Diabetes	71. Benign	96. Apicoectomy*
22. Braces*	47. Discolored	72. Periodontal*	97. Temporomandibular*
23. Speech	48. Caries*	73. Fistula*	98. Neuralgia
24. Teething	49. Infection	74. Fluorosis	99. Malalignment
25. Bleach	50. Cyst	75. Cellulitis*	

* Denotes words contained in the REALD-30.
REALD, Rapid Estimate of Adult Literacy in Dentistry.

Methods

Development of REALD. Like REALD-30, we modeled REALD-99 after REALM, where words on the instrument are ranked in order of increasing difficulty and the score is based on the number of words the subject pronounces correctly. Since its inception, REALM has been adapted to specific diseases, including arthritis and diabetes.

The words selected for REALD-99 (Table 1) include the same 30 words included in REALD-30 and 69 new words. Selection of the additional words was guided by a disease-specific framework that included etiology, anatomy, prevention, and treatment categories. All words were taken from the American Dental Association's *Glossary of Common Dental Terminology* (15). We also included words or terms from brochures and written materials provided to patients at the University of North Carolina at Chapel Hill (UNC-CH) School of Dentistry.

The words were arranged in order of increasing difficulty, based both on number of syllables and dif-

ficult sound combinations. Standard pronunciations were taken from the *American Heritage Dictionary* (16) and the *Dorland's Illustrated Medical Dictionary* (17). The READ-99 word list was designed to be read aloud by subjects to interviewers, and scored based on pronunciation. Subjects are advised to only read those words for which they believe they know the correct pronunciation. In calculating overall scores for both READ-99 and REALM, one point was assigned for each word pronounced correctly and summed. READ-99 scores have a possible range of 0 (low literacy) to 99 (high literacy); REALM scores can range from 0 to 66.

Instrument Pretest. After the initial development of the instrument and approval from the UNC Biomedical Institutional Review Board, we conducted 17 pretest interviews to refine the initial instrument and the data collection methods and to calibrate the interviewers. Subjects were recruited from pediatric dental clinics at a local health department and at the UNC-CH School of Dentistry. These pretest interviews allowed us to modify the order of words in READ-99 based on the frequency with which subjects correctly pronounced individual words.

Subject Recruitment and Data Collection. Parents and caregivers of pediatric dental patients were recruited from the UNC-CH School of Dentistry Pediatric Dental Clinics and from the Orange County Health Department Dental Clinics. Exclusion criteria included total illiteracy and inability to speak English; subjects also were excluded if the child patient was older than 15 years of age. Subjects signed institutionally approved informed consent forms and children older than 7 years of age signed assent forms for HIPAA compliance. The instruments and surveys were administered in face-to-face interviews in quiet waiting areas or private consultation rooms. The subjects were asked to read READ-99 and REALM aloud. Interviews took approximately 5 to 10 minutes.

Data for Validity Testing. The interview included questions to gather information for use as control variables and dependent variables in testing hypotheses for assessments of predictive validity. Where possible, these survey questions were derived from previously developed and tested questionnaires used in research on oral health issues. Standardized questions were used to obtain parents' ratings of self-perceived oral health and the parents' use of dental services. Parents also completed the short-form Oral Health Impact Profile (OHIP-14) (18), which consists of 14 questions regarding the extent to which oral health conditions affect one's overall dental-related quality of life. Child's dental health status as perceived by the parent was also obtained.

For control variables, we obtained information on the parents' dental use (had visited the dentist in the past 12 months; greater than 12 months; never) and on the parents' demographic characteristics including education (did not finish high school; high school diploma; GED; some college; college degree; post-graduate education), sex, race (White; Black; American Indian or Alaskan native; Asian Indian; Chinese; Japanese; Korean; Vietnamese; Native Hawaiian; Other), ethnicity (Spanish, Hispanic, or Latino; or not), and annual family income (six income categories of $19,999 each, ranging from less than $10,000 to more than $90,000).

Analytical Strategy. Internal reliability was determined using Cronbach's alpha (19). Convergent validity was tested by assessing the correlation of REALM and READ-99 scores. Predictive validity was tested by correlating READ-99 and REALM individually to dental outcomes (parents' self-perceived oral health, parents' perception of the children's oral health, and OHIP-14 score). Because of small sample sizes and to facilitate interpretation, response categories for each of the two oral health perception questions were combined to yield dichotomous variables that compared responses of "Excellent" and "Very good" with responses of "Good," "Fair," and "Poor." Responses for the dental visit question were dichotomized to reflect a visit to a dentist "within the last year" and "more than a year or not at all." Overall summary measures for OHIP-14 were calculated by summing the number of responses for which the respondent indicated that they had experienced discomfort or difficulty ("fairly often" or "often") on each item. OHIP-14 provided a continuous score ranging from 0 to 14, with a higher score indicating a worse oral health-related quality of life.

Multivariate regression models were used to test the predictive validity of READ-99 by ex-amining the relationships between READ-99 and parental perceptions of oral health for themselves and their child, and oral health-related quality of life while accounting for control variables. The models control for parental use of dental care and parent's demographic characteristics.

Results

One hundred two parents of pediatric patients were interviewed over a 6-month time frame. The characteristics of the sample are presented in Table 2. The mean READ-99 score was 83.4 [standard deviation (SD) ± 12.3, range 36 to 99]; mean REALM score was 62.3 (SD ± 5.9, range 22 to 66). The majority of parents were female, non-Hispanic, White, and reported English as their primary language and their self-perceived oral health status as good or better. About 25 percent of parents reported annual incomes of less than $10,000 and an educational level of high school diploma, GED, or less.

READ-99 was correlated positively with REALM (Pearson correlation coefficient = 0.80, $P < 0.05$). REALM was not correlated with any dental outcome measures in bivariate or multivariate analyses. In contrast, READ-99 was correlated with self-perceived oral health status of the parent (Pearson correlation coefficient = 0.61, $P < 0.05$) and OHIP-14

(Pearson correlation coefficient = 0.73, $P < 0.05$) in bivariate analyses. The mean OHIP-14 score was 4, with a range of 0 to 14. REALD-99 was not significantly associated with perceived oral health status of the child. Cronbach's alpha for REALD-99 was 0.86.

Table 3 illustrates results of the multivariate regression analyses. Presented in the first column are the OLS regression results for REALD-99 and OHIP-14. In this model, REALD-99 was significantly negatively correlated with OHIP-14 ($P < 0.05$) after controlling for parents' dental use, education, sex, ethnicity, race, primary language, income, and marital status. Also significant in the model were education, sex, ethnicity, and race ($P < 0.05$). The second and third columns report the results of the logit regression models for dental health status of parent and child, respectively. REALD-99 was not associated with either of these outcomes at a statistically significant level.

Discussion

Reliability and Validity. The REALM instrument has proven to be invaluable for health literacy investigators and practitioners. We developed the REALD-99 to serve as a comparable instrument for dentistry.

Table 2
Characteristics of the Sample

Characteristic		Number of subjects (%) ($n = 102$)
Parent's gender	Male	12
	Female	88
Hispanic	Yes	11
	No	89
Parent's race	White	64
	Black	21
	American Indian/Alaskan native	2
	Asian Indian	2
	Chinese	3
	Other	9
Primary language	English	84
	Other	16
Income	<$10,000	25
	$10,000 to $29,999	10
	$30,000 to $49,999	11
	$50,000 to $69,000	18
	$70,000 to $89,999	28
	>$90,000	7
Marital status	Married	67
	Separated	5
	Divorced	18
	Never married or single	8
	Living with partner	3
Relationship to child	Parent	95
	Grandparent	4
	Other	1
Parent's education	Did not finish high school	4
	High school diploma	18
	GED	3
	Some college	24
	College degree	29
	Postgraduate education	23

Table 3
Multivariate Regression Results for Rapid Estimate of Adult Literacy in Dentistry (REALD-99) and Dental Outcomes ($n = 102$)

Outcome measure	Oral Health Quality of Life	Parental dental health status	Child dental health status
Oral health literacy measure			
REALD-99 score	−0.74* (0.122)	0.054 (0.033)	0.003 (0.023)
Control variables			
Use of dental services (dental visit <1 year)	1.22 (1.01)	−0.033 (0.81)	−0.26 (0.62)
Education (below high school, high school, or greater)	−0.66* (0.33)	−0.67* (0.28)	−0.19 (0.20)
Parent's gender (female = 1)	2.43* (1.21)	0.25 (0.88)	1.55* (0.78)
Hispanic (Hispanic = 1)	−2.75* (1.33)	−1.42 (1.05)	0.22 (0.79)
Race (White = 1)	0.48* (0.17)	1.95* (0.87)	−0.098 (0.075)
Primary language (other than English = 1)	1.82 (1.22)	−2.21 (1.29)	−0.040 (0.18)
Income (greater than 20,000 = 1)	0.53 (0.33)	−0.36 (0.26)	0.24 (0.18)
Marital status (married = 1)	−0.091 (0.32)	−0.016 (0.242)	0.043 (0.070)
Constant	−3.53 (4.50)	−11.40 (3.75)	−2.98 (2.76)

* Significance at $P < 0.05$ level.
Standard errors are in parentheses.

Both instruments are intended for basic screening of medical health or dental health literacy. REALM has been used extensively to screen for health literacy and has no terms that are specifically related to dental health. Dental health literacy is likely a part of general health literacy and both REALD-99 and REALM are intended to measure a subset of literacy. In addition, both are based on testing one's basic word recognition ability. We expected REALD-99 and REALM to overlap to some extent because they both measure elements of health literacy; however, because REALM does not have any dental terms, it does not screen for a patients' "dental knowledge" or "exposures" to dental care, which are important aspects of dental health literacy.

We found REALD-99 reliable, and our results suggest that REALD-99 has good convergent validity, as shown by its correlation with REALM. Other validation results of REALD-99 were mixed. REALD-99 was correlated with parents' self-perceived oral health in bivariate analysis, but not in the multivariate analysis. This finding is not conclusive and requires further study with clinical measures of dental health. We also recognize that many factors can play a role in good perceptions of dental health, and we were unable to measure all of them in this study. However, REALD-99, like REALD-30, was significantly related to OHIP-14, which captures daily functional ability and psychological impacts.

Neither REALD-99 nor REALM was related to the oral health of the child. It is possible that the dental health literacy of parents is not related to their children's dental health. This conclusion has some support in the health literacy literature. A study using parents of acute-care child patients found that REALM scores did not correlate with the use of preventive services, comprehension of children's diagnosis, name of medication and instructions for use, or the ability to give medications properly (20). The investigators hypothesized that parents with low literacy were getting more information on their children's health care needs through other informational sources such as the Women, Infants and Children's program (WIC) and Medicaid clinics or hospitals.

Both REALD-99 and REALD-30 show promise as a dental health literacy word recognition instrument. Consistent results for reliability and validity from their use in two populations – one seeking dental care and the other seeking medical care – were found. Although they performed similarly, there was a difference in administration time. REALD-30 could be administered in a 2-minute interview while REALD-99 needed 5. Because both instruments yielded similar results for internal reliability and construct validity, REALD-30 would be the recommended dental health literacy word recognition instrument.

Benefits of REALD. This study makes important contributions to the field of health literacy and to the newly emerging arena of dental health literacy. Previously, dental researchers and clinicians knew only that many patients could not read at the level needed to interpret written material. This study marks a first attempt at developing a tool for identifying patients with low dental health literacy by using a word recognition instrument. A valid and reliable dental health literacy instrument will also open the door for continued dental health literacy research. REALD-30 and REALD-99 have great potential to assist in the investigation of the relationship between low dental health literacy, health, and health care inequalities and interventions for improvement of dental health outcomes.

The development of the REALM has sparked a myriad of studies evaluating many aspects of patient literacy and its effects on treatment outcomes and patient compliance. A focus group study of eight patients with low health literacy conducted by Brez and Taylor (21) found that the patients were embarrassed to admit their lack of literacy and would not always ask for help, even when confused. Importantly, six of the eight said that they would agree to be tested and all supported the use of health literacy instruments in hospitals. Subjects voiced the notion that it was better to be embarrassed than to not understand information in the health care setting. These and other similar results point to the necessity for dental health literacy instruments to be available for clinicians and for researchers.

Study Limitations. Limitations of this study include the use of a convenience sample and the introduction of some bias based on the recruitment of subjects predominantly from the UNC-CH School of Dentistry clinics. Our sample exhibited higher educational attainment than found in many other settings. Although educational level is not always a good predictor of literacy, it does play a role. The dental health literacy levels of our sample were high, with subjects pronouncing an average of 84 percent of the dental terms correctly. Dental health literacy assessment among a study population with more diverse educational attainment is an area for future research. Additionally, REALD-99 needs to be tested on actual clinical outcomes. We did not find a relationship of REALD-99 on perceived dental health status, but that can be a result of the skewed distribution and inherent limitations of self-reporting.

Like REALM, REALD is a reading recognition test and is intended only as a screening tool for basic dental health literacy and reading ability. An additional limitation of such a tool is that it is not always possible to determine if a patient really knows the meaning of a particular word or rather is simply able to pronounce it without having any knowledge of its meaning. Subjects were instructed to not guess at the pronunciation of words, but we could not be certain that all subjects read only those words that they recognized. Finally, REALD does not test for functional literacy, defined as the ability to interpret instructions or complete forms. Despite these limitations,

READLD does provide a rapid and easy method to screen for basic dental health literacy that appears to be reliable and valid.

Future Direction. The results of this study point to goals for future studies. The concept of a rapid estimate for adult literacy in dentistry should be refined with the goal of maintaining and increasing its utility as a measure of dental health literacy. REALD should be tested in a more diverse population. Use in a population more representative of rural or low-income urban Americans than the relatively high-income, highly educated patients we interviewed will also help to further investigate dental health literacy and its relationship with dental outcomes. Investigations should also include a different subset of REALD-99. In our earlier study with the REALD-30, we found good reliability, but our predictive validity results were mixed. Perhaps a different combination of words would produce better predictive validity. REALD-99 should also be tested using clinical oral health measures. With the development of the REALD instruments we only tested a person's reading ability and could not capture comprehension. Additional research also is needed to examine the full array of literacy skills, which includes reading, writing, speaking, listening, and basic mathematics (14). Development and testing of the **T**est of **F**unctional **H**ealth **L**iteracy in **D**entistry (TOFHLiD) is currently underway and should provide an additional, more comprehensive method to measure oral health literacy.

In conclusion, the paucity of knowledge of dental health literacy urges more research on this important topic. READLD has promise as an instrument for measuring the reading ability dimension of oral health literacy.

References

1. Kirsch I, Jungeblut A, Jenkins L, Kolstad A. Adult literacy in America: a first look at the results of the National Adult Literacy Survey. Washington (DC): National Center for Education Statistics, US Department of Education; 1993.
2. USDHHS. Oral health in America. A report of the Surgeon General. Bethesda (MA): National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000, pp. 47–57.
3. Davis TC, Crouch MA, Long SW, Jackson RH, Bates P, George RB, Bairnsfather LE. Rapid assessment of literacy levels of adult primary care patients. Fam Med. 1991;23:433-5.
4. Davis TC, Long SW, Jackson RH, Mayeaux EJ, George RB, Murphey PW, Crouch MA. Rapid estimate of adult literacy in medicine: a shortened screening instrument. Fam Med. 1993;25:391-5.
5. Davis TC, Arnold C, Berkel HJ, Nandy I, Jackson RH, Glass J. Knowledge and attitude on screening mammography among low-literate, low-income women. Cancer. 1996;78:1912-20.
6. Fortenberry J, McFarlane M, Hennessy M, Bull S, Grimley D, St Lawrence J, Stoner B, Paden N. Relation of health literacy to gonorrhoea related care. Sex Transm Infect. 2001;78:206-11.
7. Lindau ST, Tomori C, Lyons T, Langseth L, Bennett CL, Garcia P. The association of health literacy with cervical cancer prevention knowledge and health behaviors in a multiethnic cohort of women. Am J Obstet Gynecol. 2002;186: 938-43.
8. Arnold C, Davis T, Berkel H, Jackson R, Nandy I, London S. Smoking status, reading level, and knowledge of tobacco effects among low-income pregnant women. Prev Med. 2001;32:313-20.
9. Bennett C, Ferreira M, Davis T, Kaplan J, Weinberger M, Kuzel T, Seday M, Sartor O. Relation between literacy, race, and stage of presentation among low-income patients with prostate cancer. J Clin Oncol. 1998;16:3101-4.
10. Alexander RE. Patient understanding of postsurgical instruction forms. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1999;87:153-8.
11. Chung V, Horowitz AM, Canto MT, Siriphant P. Oral cancer educational materials for the general public. J Public Health Dent. 2000;60:49-52.
12. Mortensen MG, Kiyak HA, Omnell L. Patient and parent understanding of informed consent in orthodontics. Am J Orthod Dentofacial Orthop. 2003;124: 541-50.
13. Alexander RE. Readability of published dental educational materials. J Am Dent Assoc. 2000;131:937-42.
14. Lee JY, Rozier RG, Lee D, Bender D, Ruiz R. Development of a word recognition instrument to test health literacy in dentistry: READLD-30. J Public Health Dent. 2007;67(2):124–8.
15. ADA. Glossary of common dental terminology. Chicago (IL): American Dental Association; 1999.
16. The American heritage dictionary of the English language. Philadelphia (PA): Houghton Mifflin; 2000.
17. Dorland WAN. Dorland's illustrated medical dictionary. Philadelphia (PA): W. B. Saunders; 2000.
18. Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol. 1997; 25:284-90.
19. Cronbach L. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16:297-334.
20. Moon RY, Cheng TL, Patel KM, Baumhaft K, Scheidt PC. Parental literacy level and understanding of medical information. Pediatrics. 1998;102:e25.
21. Brez SM, Taylor M. Assessing literacy for patient teaching: perspectives of adults with low literacy skills. J Adv Nurs. 1997; 25:1040-7.