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Comparing Well-Tested Health Literacy Measures for Oral Health: A Pilot Assessment

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Abstract

There has been growing national concern over the low health literacy of Americans, and coinciding with this, a growing importance placed on measuring health literacy. Health literacy is the ability to access, understand and use information to make health decisions. Health literacy in an oral health context means access to accurate information about oral health, understanding the risks of neglecting oral care, and calculating the chances of getting periodontal disease. This current exploratory study compared the three most popular and well-tested health literacy measures in an oral health setting. Using a survey of dental patients from safety net dental clinics in two states, researchers explored differences and similarities between health literacy measures as they pertained to oral health perceptions and oral self-efficacy. Findings indicated that the three health literacy measures were not interchangeable and had differential effects on data collected, which suggested differential relationships with oral health perceptions and outcomes.

There has been growing national concern over the low health literacy of Americans (Office of the Surgeon General, 2006; Rudd, Rosenfeld, & Simonds, 2012; U. S. Department of Health and Human Services, 2010), and coinciding with this, a growing importance placed on measuring health literacy. The U.S. Patient Protection and Affordable Care Act listed low health literacy as a barrier to care in underserved populations (ACA, 2010, subtitle D, sec. 5301, 31), and measuring health literacy across different groups has become a critical area for scholarly and practical debate in health communication.

For the last few years, health literacy has been the focus of a special issue in *Journal of Health Communication: International Perspectives*, and significant progress has been made by authors developing, testing or debating measures that can operationalize and score a person's health literacy level (see for examples, Haun, Valerio, McCormack, Sorensen, Paasche-Orlow, 2014; Mackert, Champlin, Pasch, Weiss, 2013; Nguyen, Paasche-Orlow, Kim, Han, & Chan, 2015; Pleasant, 2014). Health literacy is the ability to access, understand

and use information to make health decisions (Nielsen-Bohlman, Panzer, & Kindig, 2004; Ratzan & Parker, 2000). Being health literate means being able to: understand the side effects of medication; fill out health and insurance forms correctly; ask health care providers the right questions; and accurately calculate the chances of getting disease.

Health literacy in an oral health context is defined as access to accurate information about oral health, understanding the risks of neglecting oral care, and calculating the chances of getting periodontal disease (Horowitz & Kleinman, 2012; Horowitz, Kleinman, Child, & Maybury, 2015). Health literacy in dentistry has borrowed methods and models from research in medicine; and oral health scholars are similarly concerned about how to best operationalize health literacy. Understanding how to measure health literacy for oral health is a challenge for health communication research. Some authors have claimed that the ability to measure health literacy “may well be the most significant and necessary task facing health literacy research and practice” (Pleasant, McKinney, & Rikard, 2011, p. 11). This current exploratory study contributes to the discourse in this area by offering the health communication field a comparison of the three most popular and well-tested health literacy measures in an oral health setting. Using a survey of dental patients from safety net dental clinics in two states, researchers explored differences and similarities between health literacy measures as they pertained to oral health perceptions and oral self-efficacy.

Literature Review

Impact of Low Health Literacy

According to the most recently published, national assessment of health literacy, only 12% of adults have average health literacy (Kutner, Greenberg, Jin, Paulsen & White, 2006). Fourteen percent (30 million) of Americans have below basic health literacy, which means they are unable to perform “even the simplest everyday literacy tasks” related to their health – such as reading a medical chart or instructions for medication (U.S. DHHS, 2010). Low health literacy disproportionately affects lower socioeconomic groups and people of color, although “people of all ages, races, incomes and education levels” can have low health literacy (U. S. DHHS, 2010, p. 4).

Researchers have found low oral health literacy among various populations, including those with high levels of formal education. Low health literacy has been found to have direct and indirect effects on perceived oral health status, and oral health outcomes (Horowitz et al., 2015; Horowitz, Kleinman, & Wang, 2013). Low health literacy has also been significantly associated with poor patient-dentist communication, low perceived oral health status, self-efficacy, and periodontal disease (Guo, Dodd, Muller, Marks, & Riley, 2014; Wehmeyer, Corwin, Guthmiller, & Lee, 2014). Research has also found that low health literacy among caregivers negatively impacted oral health behaviors in infants and young children (Vann, Lee, Baker & Divaris, 2010).

Health Literacy and Perceived Health Status—Notably, those with below basic health literacy are 42% more likely to report poor health than people with proficient health literacy (U. S. DHHS, 2010). Some studies have supported the association between low health literacy and perceived poor health status (Hsu, Chiang, & Yang, 2014; Vozikis,

Drivas, & Milioris, 2014). However, a few authors have argued for no relationship. One study found that functional health literacy is not independently associated with perceived physical health status or mental health status among Latinos and African Americans in the sample (Guerra & Shea, 2007). Other scholars have noted mixed findings, with health literacy dependent on race and ethnicity in order to influence perceived health status (Bennett, Chen, Soroui, & White, 2009). Perhaps the differences in findings are the result of different health literacy scales used. This current pilot explored how different health literacy measures might be related to perceived health status differently.

Health Literacy and Self-Efficacy

Numerous studies have shown that health literacy is significantly related to perceived self-efficacy (Donovan-Kicken, Mackert, Guin, Tollison, Breckenridge, & Pont, 2012; Fry-Bowers, Maliski, Lewis, Macabasco-O'Connell, & DiMatteo, 2014; Lee, Shin, Wang, Lin, Lee, & Wang, 2016; Osborn, Cavanaugh, Wallston, Rothman, 2010; Torres & Marks, 2009). In the limited oral health research that has been done on this topic, similar results have been found (Lee, Divaris, Baker, Rozier, Vann, 2012). The body of work on self-efficacy and health literacy has generally used three well-tested scales for measuring health literacy: the Newest Vital Sign (Weiss, Mays, Martz, Castro, DeWalt, Pignone et al., 2005), the Rabid Estimate of Adult Literacy in Medicine (REALM) (Davis, Long, Jackson, Mayeaux, George, Murphy et al. 1993) or Dentistry (REALD) (Atchison, Girona, Messadi, & Der-Martirosian, 2010; Stucky, Lee, Lee, Rozier, 2011), and the Test of Functional Health Literacy in Adults (TOFHLA) (Baker, Williams, Parker, Gazmararian, & Nurss, 1999; Parker, Baker, Williams & Nurss, 1995). While each study revealed significant findings, no study used more than one health literacy measure to note any differences across the sample depending on measure used. This current pilot fills this gap by exploring the use of all three measures and their relationship with oral self-efficacy.

Health Literacy Skills Focus

Traditionally, health literacy was operationalized by reading comprehension and numeracy. Numeracy is defined as a “facility with basic probability and numerical concepts” (Schwartz, Woloshin, Black, & Welch, 1997, p. 967). Today, many health literacy scholars argue that people need to exhibit a host of skills beyond reading and numeracy, such as how to navigate websites, how to evaluate good from bad information, and how to listen, speak and ask questions, in order to get the right health information (Squiers, Peinado Berkman, Boudewyns, & McCormack, 2012; Zarcadoolas, Pleasant, & Greer, 2006). Functional health literacy is the type of health literacy that focuses on skills needed to manage health decisions (Nutbeam, 2000). Functional health literacy involves “reading, writing, numeracy, listening, oral and visual communication, problem solving and decision making” (Helitzer, Hollis, Sanders & Roybal, 2012, p. 161). Much of the scholarly work in health literacy emphasizes the functional approach and has attempted to operationalize the skills needed to be health literate. Thus, most of the published literature has focused on measurement and scales development (Altin, Finke, Kautz-Freimuth, & Stock, 2014; Haun et al., 2014; Rudd et al., 2012).

Health Literacy Measurement

Hundreds of studies can be found that test existing measures of health literacy or develop new measures of health literacy, and there are meta-analyses to offer reviews of measures (see Al Sayah, Maiumdar, Williams, Robertson, & Johnson, 2013; Altin et al., 2014; Haun et al., 2014; Pleasant et al., 2011; Zhang, Terry, & McHoney, 2014). Within this large and growing body of knowledge are a few measures that are popular and well tested for health literacy. Three well-known health literacy measures are: Rapid Estimate of Adult Literacy in Medicine (REALM); Test of Functional Health Literacy in Adults (TOFHLA); and the Newest Vital Sign. Each are briefly described below.

REALM—The Rapid Estimate of Adult Literacy in Medicine is a 66-item measure of medical term identification and pronunciation (Davis et al. 1993). The main concepts tested are word recognition and phonetic reading ability. The participant is asked to read aloud a list of words that get increasingly more difficult. There have been variations of the REALM for other contexts, such as REALM-Teen for adolescents (Davis, Wolf, Arnold, Byrd, Long, Springer et al., 2006). Other, shorter versions of the REALM have been attempted, but with limited application (Bass, Wilson, & Griffith, 2003; Arozullah et al., 2007). Versions of REALM have been created for oral health literacy, such as REALD-30, REALD-99, and REALMD (Atchison et al., 2010; Stucky et al., 2011). These measures model the original REALM in that they are lists of terms related to dental and oral health care that are to be read aloud by the participant. Some studies have found that the REALM is an effective measure of reading and pronunciation ability, but not always of health literacy, which presents as more complex than that which can be measured through vocabulary (Dumenci, Matsuyama, Kuhn, Perera, & Siminoff, 2013).

TOFHLA—The Test of Functional Health Literacy in Adults is a measure that uses reading context to replace missing words from two medical intake forms (Baker et al., 1999; Parker et al., 1995). The main concept measured is reading comprehension, but it also offers context to the words used by asking about common medical practices, such as x-rays. Participants fill in blanks in sentences with one multiple, closed-choice option of a medical or health term. The original TOFHLA has been criticized for the time it took to complete the test, but there is currently a popular short version that has good validity and reliability compared to its original longer form. The short-version is a 36-item version, which has often been used to correlate with physical and mental health status (Wolf, Gazmararian, & Baker, 2005). However, the short form can still take up to ten minutes to administer. In oral health literacy research, the TOFHLA has been used somewhat less often than REALD or REALM-D, likely due to lack of dental settings, but the TOFHLiD has been created and uses the Cloze method with dental passages (Gong, Lee, Rozier, Pahel, Richman, & Vann, 2007).

Newest Vital Sign—A third measure is the Newest Vital Sign (NVS), which uses a “real world” setting of reading a nutrition label as its context. The label is from a carton of ice cream. The measure is easy to use and contextualized in an everyday item, that of a food label, to give participants meaning to the index. The NVS measures reading, numeracy, and navigational ability by asking 6 questions (Weiss et al., 2005). It takes a significantly shorter

amount of time to administer than the other two health literacy measures described here (Shah, West, Bremmeyr, & Savoy-Moore, 2010); most participants can complete the test in under 6 minutes. Published research was not found that applied the NVS to oral health settings.

Comparison Studies

A few studies were found that compared health literacy measures, though only one was found that compared them for oral health attitudes and behaviors. One study investigated the effects of cognitive processing on two of the health literacy measures, the S-TOFHLA and the REALM. Researchers found that the S-TOFHLA reflected high scores when participants had high cognitive processing skills and health knowledge, whereas the REALM was dependent on just general and health knowledge (Chin, Morrow, Stine-Morrow, Conner-Garcia, Graumlich, & Murray, 2011). Authors concluded that the two measures' moderate correlations with each other suggested that they overlap in measuring a common construct, but that the two tests "tap different abilities reflecting different task demands" (p. 237). A second study assessed the S-TOFHLA and NVS among a sample of English and Spanish-speaking patients (Ramirez-Zohfeld, Rademaker, Dolan, Ferreira, Eder, Liu, Wolf et al., 2015). Authors indicated that the two measures were strongly correlated among the Spanish speakers and more so than for English speakers. English speakers scored higher on the S-TOFHLA as compared to the NVS, whereas Spanish speakers scored consistently low on both measures. Another study compared all three, the NVS, REALM and S-TOFHLA, and found that the NVS was as useful in measuring health literacy as the other two measures, if not more so due to its brevity and simple administration. However, the NVS was not as effective at predicting health outcomes, such as cholesterol levels, medication adherence and hypertension (Osborn, Weiss, Davis, Skripkauskas, Rodrigue, Bass, & Wolf, 2007). In oral health, Macek and colleagues used the REALM and S-TOFHLA to assess a new oral health knowledge instrument. Findings showed that REALM data were significantly associated with oral health knowledge, but S-TOFHLA items were not (Macek, Haynes, Wells, Bauer-Leffler, Cotten, & Parker, 2010).

Some authors have claimed that the frequently tested measures are not based in theory; rely too heavily on reading, writing and math alone; focus on single dimensions of health literacy; or rely on context of clinical settings or diagnostic tests (Dumenci et al., 2013; Pleasant et al., 2011; Rubin, Parmer, Freimuth, Kaley, & Okundaye, 2011). The body of literature has been primarily within medicine, and limited work has been done comparing the value of the frequently used measures. More research needs to be done for better understanding of oral health literacy and for valid measures to use for measuring health literacy in dental settings. With this in mind, the following research questions were posed for the current study:

RQ1: How do average health literacy scores measured through REALM, S-TOHFLA and NVS compare across a sample of dental patients?

RQ2: How do health literacy scores measured through REALM, S-TOHFLA and NVS compare when associated with perceived health status?

RQ3: How do health literacy scores measured through REALM, S-TOFHLA and NVS compare when associated with oral health self-efficacy?

Method

The data described here are part of a larger study titled, *Multi-Site Oral Health Literacy Research Study* (MOHLRS), which was an investigation of the relationships between health literacy and oral health. The study was a cross-sectional, interviewer-administered survey conducted among dental patients in urban, safety net clinics in California and Maryland. Interviewers used computer-assisted personal interviewing (CAPI) questionnaires to collect data on health literacy, oral health knowledge and practices, and demographics.

Population and Sample

The target population was English-speaking, initial care-seeking, adult patients of clinics affiliated with two schools of dentistry. “Initial care-seeking” patients were defined as either new patients to the clinics or patients who had no more than four total visits to the respective sites during the preceding five years. Ineligible patients included those who did not speak English, who had notable vision and/or hearing disabilities, and who were trained or employed as nurses, physicians, or dental personnel. A total of 922 individuals were recruited into MOHLRS.

Completed questionnaires, where all responses to REALM, S-TOFHLA and NVS items were received, were available for 574 participants. The sample was 52% female, with 42% white, 32% black, 16% Latino, and 10% other race. Almost 42% were between ages 18 and 44, and 11% were 65 years old or older. The education level was spread across the sample: 30% less than high school, 33% some college, and 37% college graduated. In terms of annual household income, almost 60% of the sample reported \$44,000 or less. Language spoken as a child was predominantly English, though 14% reported other than English as their main language spoken.

Instrumentation

Survey instructions and any text needing to be read were provided at a reading level of 4th to 6th grade. The questionnaire included items for the three measures of health literacy, self-reported health literacy, perceived health status, oral health self-efficacy, and demographics.

Health Literacy Measures—The health literacy instruments used were REALM, S-TOFHLA, and NVS. The REALM includes 66 medical and health words listed in three columns that get increasingly more advanced in reading level. The medical REALM and S-TOFHLA were used here rather than their dental counterparts in order to compare participant results to the Newest Vital Sign. In other words, because the Newest Vital Sign does not have a dental measure, we wanted to ensure the comparison was equivalent in conceptualization, and thus used the non-oral measures of REALM and S-TOFHLA. For REALM, the participant was asked to read aloud the list of words, as best they can, and to stop when they come to words they cannot pronounce or read. Scoring was based on number of words correct: low health literacy = 0 to 44 correct words; middle health literacy = 45 to

60 correct words; and high health literacy = 61 to 66 words correct. Cronbach's alpha for REALM was .954. The S-TOFHLA included all 36 items and participants replaced blanks with multiple-choice options of medical and health terms. The final score was how many blanks were filled in correctly out of 36. For the current analysis, low health literacy = 0 to 16 correct; middle health literacy = 17 to 22 correct; and high health literacy was a score above 22. The final score for each participant was manually calculated and then entered into the database, and thus Cronbach's alpha was not possible to calculate. The NVS consisted of 6 questions based on the original nutritional label used by. The first four questions addressed numeracy and navigation, by asking how many servings, calories and carbohydrates can be found. The last two questions asked participants to find out if they could eat the ice cream if they were allergic to peanuts. Scoring was by how many correct: low health literacy = 0 to 1 correct; middle health literacy = 2 to 3 correct; and high health literacy = 4 and above correct. Cronbach's alpha for NVS scores reached .775.

Perceived Health Status—Perceived health status was measured using two Likert-scale items from the National Health Interview Survey (Parsons, Moriarty, Jonas et al., 2014). One assessed self-reported “dental health” status and the other “general health” status. Both original items were Likert-scale ranging from “excellent” health status to “poor” health status. The responses were recoded into “low” health status (includes “fair” and “poor” responses) and “high” (includes “excellent,” “very good” and “good” responses).

Oral Health Self-efficacy—Self-efficacy was measured for oral health and included two items. This was to create more defined dimensions for what self-efficacy can be in oral health, where prevention measures could center on cavity risk or on risk of gum infection. One item measured how confident participants were in knowing how to prevent “tooth decay,” and the second item measured how confident they were in knowing how to prevent “gum disease.” Data were then re-coded into “low” (combined “somewhat unsure” and “very unsure”) or “high” (combined “somewhat sure” and “very sure”) self-efficacy.

Demographics—The sociodemographic covariates included age, sex, race/ethnicity, education level, annual household income, languages spoken, marital status, and dental insurance status. Language spoken was measured as a combination of two attributes: languages spoken currently and primary language spoken as a child.

Procedures

Research methods were reviewed and approved by the institutional review boards at the researchers' academic institutions. Prospective participants were recruited from clinic waiting rooms by trained research team members. Patients who wished to be involved could participate immediately or were given the option to schedule data collection at another time (especially important for individuals who were in pain or distress during the initial visit). Once a participant agreed and signed consent forms, interviewers administered the questionnaire by way of a CAPI questionnaire and an accompanying tablet. Response categories for selected items were on the tablet's screen, allowing participants to see response choices at the same time that interviewers read them aloud. Participants received an

incentive after completing the survey. The interview session took approximately 40 minutes and was administered by trained interviewers.

Data Analysis

Each participant was assigned a unique identifier to keep their identity anonymous. The SAS® statistical software program for Windows (Version 9.3) was used for data cleaning and analysis. While we planned to use the established cut-offs in score for coding each of the health literacy scales, scores for the two lowest categories of the REALM and S-TOFHLA had to be combined due to small cell sizes. This also allowed for easier comparisons since all three indices now had three levels of scores each (“low,” “middle,” and “high” health literacy score). In order to make scores comparable, since raw scoring across index is not compatible, percentages were calculated from raw average scores for certain runs.

Some questionnaires had missing sociodemographic data. Specifically, education level, languages spoken, and marital status were missing from 7 or 8 questionnaires. These data were imputed using IVEware statistical software (Version 0.2; University of Michigan 2012).

Since this was an exploratory pilot with a non-probability sample, univariate analysis of percentages and frequencies was used to summarize quantitative responses. Bivariate analyses tested relationships between the health literacy measures and perceived health status, self-efficacy and demographics. Where appropriate, Pearson’s correlations or crosstabs with Fisher exact and chi square tests were used, to note significant differences between health literacy scales and with the dependent measures.

Results

Overall, participants scored high on all three health literacy measures. There was no significant difference between Maryland and California samples in health literacy scores. Frequency distributions in score level across all three measures were positively skewed. Not surprisingly, participants who spoke a language other than English had lower health literacy scores overall than participants who spoke only English. There were no significant differences in health literacy score between males and females in the sample or on other demographic characteristics.

RQ1: Health Literacy Scores across the Sample?

The score distribution for NVS was somewhat different in that it skewed less toward high score. The REALM and S-TOFHLA revealed similar median percentage scores (97% correct), while the NVS revealed much lower median percentage score (67% correct). Table 1 shows the distribution of each health literacy measure against demographic variables that reveal some differences. For the REALM, about 20% of participants scored in the lowest two categories (0-60 score range). REALM score was not statistically associated with age, race/ethnicity or income, but did significantly relate to education level (chi-square value = 50.41, $p < 0.01$). For S-TOFHLA, only 6% scored in the lowest two categories (0–22 score range). This scale differed from REALM in that the relationship was statistically significant

with age (chi-square value = 18.82, $p < .01$) and race/ethnicity (chi-square value = 15.79, $p < .05$), as well as education level (chi-square value = 46.12, $p < .01$). Using the NVS we find that 36% of the sample scored in the lowest two ranges (0–3 correct), much higher amount than with the other two measures. Like the S-TOFHLA, NVS scores were significantly associated with age (chi-square value = 29.57, $p < .01$), race/ethnicity (chi-square value = 29.17, $p < .05$), and education level (chi-square value = 49.78, $p < .01$).

RQ2: Health Literacy Measures Compared when Associated with Perceived Health Status?

In Table 2, relationships between the three health literacy measures and perceived dental status and health status are provided. Data for the NVS showed significantly different results compared to REALM and S-TOFHLA. Both the REALM and S-TOFHLA indicated no significant associations with perceived oral or general health status. The NVS, however, was significantly associated with dental health status and general health status across its score levels. In particular, low health literacy as measured by the NVS was associated with low perceived dental health status (chi-square value = 7.29, $p < .05$). Similarly, low health literacy with the NVS was also significantly associated with low perceived general health status (chi-square value = 6.36, $p < 0.05$).

RQ3: Health Literacy Measures Compared when Associated with Oral Health Self-Efficacy?

All three health literacy measures revealed statistical significance with perceived periodontal disease self-efficacy (See Table 3). For perceived self-efficacy with dental caries, though, only REALM was significantly related. The REALM resulted in associations with both self-efficacy items, such that high health literacy was related to high self-efficacy for preventing dental caries (chi-square value = 6.10, $p < .05$); and high health literacy was associated with high self-efficacy for preventing periodontal disease (chi-square value = 15.65, $p < .01$). For the other two health literacy measures, participants with low health literacy were more likely to have low perceived periodontal disease self-efficacy.

Discussion/Conclusion

This exploratory study used a survey of dental patients to compare differences and similarities between the three most frequently used health literacy measures. Data showed that average health literacy scores were high. While the sample did have participants of low SES, this finding is consistent with those in the sample from high SES, and perhaps reflective of a care-seeking population who were motivated to attend a dental clinic. This high average health literacy resulted with all the measures used, as it was not unique to any one scale. This finding refuted Chin et al. 's (2011) that S-TOFHLA and REALM differed, but the care seeking behavior of participants might have been the guiding factor in finding high health literacy across the measures.

Findings revealed some significant differences in health literacy measures and differences in how each measure relates to important factors such as perceived health status and self-efficacy. The Newest Vital Sign was the most challenging of the three scales for participants, which supports previous research (Ramirez-Zohfeld et al., 2015). Scores from the NVS were lower and were associated with age, race and ethnic background, and education level. The S-

TOFHLA represented the proportionately highest scores for participants while still reflecting differences across patient demographic characteristics. It is possible that the NVS reflects a more realistic level of health literacy given its everyday context of a nutrition label and the complexities of a label. While it is the briefest of scales, it is harder because it requires numeracy and navigational skills, which the other two measures do not (Weiss et al., 2005).

Low NVS was also associated with both low perceived dental and low general health status, when the other two measures revealed no significant differences in perceived health status. This finding supports the argument that the choice of health literacy measure may affect relationships with perceived health status. Our findings were mixed, reflecting the differing results found in the literature (Bennett et al., 2009; Hsu et al., 2014, Guerra & Shea, 2007). The mixed findings may also be an indicator of the poor proxy measure for perceived health status. Perceived health status as currently assessed may not be a valid indicator for how individuals perceive their physical or oral health, at that moment or long term.

Regarding self-efficacy, two indicators were used to distinguish between oral health self efficacy involving cavities (dental caries) and periodontal disease. All three health literacy scales similarly related to self-efficacy for how to prevent periodontal disease. This finding supports former research showing the link between health literacy and self-efficacy (Donovan-Kicken et al., 2012; Fry-Bowers et al., 2014), in particular, in an oral health setting (Lee et al., 2012). Only the REALM was able to detect differences in perceived self-efficacy for preventing tooth decay. This difference may be due to a perceived higher level of risk and severity that participants viewed gum disease to have. It may also mean that people get tooth decay as children and thus have always had to deal with it, so may feel uncertain as to how to prevent it. A methodological interpretation is that this finding reflects poor construct validity of the items used to measure dental caries and gum disease prevention.

In general, findings indicated that in this study, the three health literacy measures were not interchangeable and had differential effects on data collected, which resulted in differential relationships with oral health perceptions. Although the three health literacy assessments are meant to measure the same construct, this pilot highlights the need to select an appropriate measure of health literacy for each study's purpose. Our findings support the research that had previously taken on the task of comparing health literacy measures (Chin et al., 2011; Ramirez-Zohfeld et al., 2015; Osborn et al., 2007; Macek et al. 2010). However, the data uniquely contributes to oral health literacy and a call for more research on identifying effects of health literacy.

This pilot study had some limitations. Given the fact that findings derive from patients who sought initial care at university-based dental clinics, results are not generalizable to the general public or perhaps to persons who sought dental care in other care settings. Also, while income level varied among the sample and included low-income participants, it was difficult to recruit individuals with lowest levels of education. These individuals face greater health literacy challenges within the healthcare system, and findings do not reflect the potentially critical associations that might have been found among this group. Furthermore, there were some limitations in the measures used. Due to our interest in comparing the two, most popular health literacy measures with the Newest Vital Sign, we needed to use the non-

oral health versions of REALM and S-TOFHLA, which may have reduced the ability to accurately reflect oral health literacy.

Future research can address these limitations. Studies in the field should focus on comparison research that assesses validity and contextual applications of the most well tested measures. Additional research might address oral health disparities and how different measures affect different population groups. Studies can also provide greater insight into the effects that healthcare-related covariates, such as health insurance enrollment, might have on different health literacy measures in comparison to each other. These and other studies in health communication can offer the field of dentistry greater understanding of health literacy measures, while also contributing to the scholarship in health communication regarding health literacy comparisons across indices and within an applied context.

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Table 1

Frequency (%) of score level for the REALM, S-TOFHLA and NVS, by selected demographics (n=574)

	REALM score levels			S-TOFHLA score levels			NVS score levels		
	Low	Middle	High	Low	Middle	High	Low	Middle	High
Overall	14 (2.4)	103 (18.0)	457 (79.6)	14 (2.4)	19 (3.3)	541 (94.3)	81 (14.1)	125 (21.8)	368 (64.1)
Age									
18-24	0 (0.0)	14 (26.9)	38 (73.1)	0 (0.0)	0 (0.0)	52 (100.0)	3 (5.8)	7 (13.4)	42 (80.8)
25-44	3 (1.5)	36 (17.6)	165 (80.9)	0 (0.0)	5 (2.5)	199 (97.5)	14 (6.9)	42 (20.6)	148 (72.5)
45-64	8 (3.5)	44 (19.2)	177 (77.3)	8 (3.5)	9 (3.9)	212 (92.6)	45 (19.7)	52 (22.7)	132 (57.6)
65 or older	3 (3.4)	9 (10.1)	77 (86.5)	6 (6.8)	5 (5.6)	78 (87.6)	19 (21.3)	24 (27.0)	46 (51.7)
Race/ethnicity									
White	4 (1.6)	35 (14.0)	211 (84.4)	3 (1.2)	3 (1.2)	244 (97.6)	26 (10.4)	43 (17.2)	181 (72.4)
Black	6 (4.5)	29 (21.6)	99 (73.9)	7 (5.2)	7 (5.2)	120 (89.6)	27 (20.1)	32 (23.9)	75 (56.0)
Asian	0 (0.0)	7 (21.9)	25 (78.1)	0 (0.0)	1 (3.1)	31 (96.9)	5 (15.6)	3 (9.4)	24 (75.0)
other	0 (0.0)	7 (14.3)	42 (85.7)	0 (0.0)	2 (4.1)	47 (95.9)	2 (4.1)	18 (36.7)	29 (59.2)
Hispanic	4 (3.7)	25 (22.9)	80 (73.4)	4 (3.7)	6 (5.5)	99 (90.8)	21 (19.3)	29 (26.6)	59 (54.1)
Education level									
<12 years	5 (16.1)	7 (22.6)	19 (61.3)	4 (12.9)	3 (9.7)	24 (77.4)	8 (25.8)	11 (35.5)	12 (38.7)
12 years	5 (4.8)	32 (30.5)	68 (64.7)	7 (6.6)	9 (8.6)	89 (84.8)	30 (28.6)	31 (29.5)	44 (41.9)
Some college	3 (1.6)	32 (17.2)	151 (81.2)	1 (0.5)	3 (1.6)	182 (97.9)	22 (11.8)	41 (22.1)	123 (66.1)
College grad	1 (0.4)	32 (12.7)	219 (86.9)	2 (0.8)	4 (1.6)	246 (97.6)	21 (8.3)	42 (16.7)	189 (75.0)
Annual income									
\$0-\$22,000	7 (3.5)	37 (18.2)	159 (78.3)	3 (1.5)	8 (3.9)	192 (94.6)	31 (15.3)	55 (27.1)	117 (57.6)
\$22,001-\$44,000	3 (2.1)	24 (16.8)	116 (81.1)	6 (4.2)	4 (2.8)	133 (93.0)	19 (13.3)	30 (21.0)	94 (65.7)
\$44,001-higher	1 (0.7)	27 (17.4)	127 (81.9)	1 (0.7)	3 (1.9)	151 (97.4)	17 (11.0)	28 (18.0)	110 (71.0)
Undetermined	3 (4.1)	15 (20.6)	55 (75.3)	4 (5.5)	4 (5.5)	65 (89.0)	14 (19.2)	12 (16.4)	47 (64.4)

Table 2

Frequencies (%) of perceived dental and general health status, by REALM, S-TOFHLA and NVS score levels (n=574)

Health literacy	Perceived dental health status		Perceived general health status	
	Low	High	Low	High
Overall	307 (53.5)	267 (46.5)	80 (13.9)	494 (86.1)
REALM				
Low	8 (57.1)	6 (42.9)	4 (28.6)	10 (71.4)
Middle	59 (57.3)	44 (42.7)	16 (15.5)	87 (84.5)
High	240 (52.5)	217 (47.5)	60 (13.1)	397 (86.9)
S-TOFHLA				
Low	7 (50.0)	7 (50.0)	3 (21.4)	11 (78.6)
Middle	11 (57.9)	8 (42.1)	4 (21.0)	15 (79.0)
High	289 (53.4)	252 (46.6)	73 (13.5)	468 (86.5)
NVS				
Low	53 (65.4) *	28 (34.6) *	18 (22.2) *	63 (77.8) *
Middle	71 (56.8) *	54 (43.2) *	19 (15.2) *	106 (84.8) *
High	183 (49.7) *	185 (50.3) *	43 (11.7) *	325 (88.3) *

* Statistically significant at $p < .05$

Table 3

Frequencies (%) of perceived self-efficacy on prevention of dental caries and periodontal disease, by REALM, S-TOFHLA and NVS score levels (n=574)

Health literacy	Perceived self-efficacy for knowing how to prevent dental caries		Perceived self-efficacy for knowing how to prevent periodontal disease	
	Low	High	Low	High
Overall	106 (18.5)	468 (81.5)	137 (23.9)	437 (76.1)
REALM				
Low	5 (35.7) *	9 (64.3) *	8 (57.1) **	6 (42.9) **
Middle	25 (24.3) *	78 (75.7) *	34 (33.0) **	69 (67.0) **
High	76 (16.6) *	381 (83.4) *	95 (20.8) **	362 (79.2) **
S-TOFHLA				
Low	3 (21.4)	11 (78.6)	7 (50.0) *	7 (50.0) *
Middle	4 (21.0)	15 (79.0)	6 (31.6) *	13 (68.4) *
High	99 (18.3)	442 (81.7)	124 (22.9) *	417 (77.1) *
NVS				
Low	17 (21.0)	64 (79.0)	30 (37.0) **	51 (63.0) **
Middle	28 (22.4)	97 (77.6)	30 (24.0) **	95 (76.0) **
High	61 (15.6)	307 (83.4)	77 (20.9) **	290 (79.1) **

* Statistically significant at $p < .05$

** Statistically significant at $p < .01$