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Health Literacy

The association between health literacy and indicators of cognitive impairment in a diverse sample of primary care patients

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ABSTRACT

Objectives: To confirm the association of health literacy scores as measured by Health Literacy Assessment Using Talking Touchscreen Technology (Health LiTT) with cognitive ability and education. To determine whether this association differs by cognitive task.
Methods: Cognitive impairment was measured using the Mini-Cog, which combines a delayed word recall task (WRT) and a clock drawing task (CDT) to yield an overall classification of normal versus cognitively impaired. Participants were recruited from primary care clinics that provide care to underserved patients.
Results: Participants ($n = 574$) were predominantly non-Hispanic black (67%) with a mean age of 46 years, 50% did not have health insurance, 56% had a high school education or less and 21% screened positive for cognitive impairment. Overall cognitive ability and education were significantly associated with health literacy after adjusting for other variables, including race/ethnicity and physical health. We observed a stronger association between the CDT and health literacy than between the WRT and health literacy.
Conclusion: By confirming hypothesized associations, this study provides additional support of the validity of Health LiTT.
Practice implications: Health LiTT is a reliable and valid tool that researchers and clinicians can use to identify individuals who might have difficulty understanding health information.

1. Introduction

Health Literacy Assessment Using Talking Touchscreen Technology (Health LiTT) is a new computer-based tool that can be used in clinical practice and research to assess patients' health literacy [1,2]. For the purpose of this measurement tool, we define health literacy as the capacity to read and comprehend health-related print material, identify and interpret information presented in graphical format (charts, graphs and tables), and perform arithmetic operations in order to make appropriate health and care decisions [3]. Health LiTT was created to measure a breadth of literacy levels and can be administered as a short form test or using computer adaptive testing (CAT). CAT uses computer algorithms to select the best test items based on responses to previous items. This approach minimizes the assessment length, while maximizing the precision of the measurement of health literacy. As a new tool, it is important to know how Health LiTT is related to other commonly used measures in the health care setting: (1) cognitive ability, and (2) years of education.

Health LiTT has been shown to be acceptable to a wide variety of patients, including those who are computer naïve and older [2], and initial evidence supports the validity of this new tool [1,4]. Validation of a new measurement tool requires building a weight of evidence demonstrating that the instrument is measuring the construct of interest and that the scores behave as hypothesized [5]. Two variables consistently shown to be independently associated with better health literacy in numerous previous studies are normal cognitive ability and higher educational attainment [6–13]. The relationship between health literacy, cognitive ability, and education is complex and the causal direction of the associations is difficult to tease apart [8]. However, demonstrating independent associations of cognitive ability and education with health literacy as measured by Health LiTT would further support the validity of this new measure.

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The overall objective of this study was to determine whether the established associations between health literacy, education, and cognitive ability are confirmed when health literacy is measured by the new Health LiTT. The strength of association between health literacy and cognitive ability may vary by how these constructs are measured [13]. Thus, a secondary objective was to assess whether the association between health literacy and cognitive ability differed by type of cognitive task.

2. Methods

2.1. Participants

Data for this unplanned secondary analysis were from a sample of primary care patients who participated in a study to develop and calibrate Health LiTT [1,2]. Participants in the parent study were recruited from two urban and two suburban primary care clinics that provide care to underserved patients, many of whom do not have health insurance. Two recruitment methods were used at both clinics: flyers posted near the reception desk and direct invitation by a research assistant in the waiting area. Eligibility criteria for the parent study included age 21 years or older, English-speaking, and sufficient hearing, vision, cognitive function, and manual dexterity to interact with the touchscreen laptop as judged by the research assistant during the enrollment process [1,2]. Informed consent was obtained from all participants in accordance with institutional review board requirements. Participants received $20 for completing the assessment.

2.2. Measures

Health LiTT assesses three types of health literacy skills: prose, document, and quantitative. Prose literacy focuses on the understanding and use of information from texts; document literacy requires the ability to locate and use information from forms, tables, graphs, etc.; and quantitative literacy requires the ability to apply arithmetic operations using numbers embedded in printed materials. With Health LiTT, one question at a time is displayed on the touchscreen. All document and quantitative items are accompanied by an audio recording of the question to mitigate the influence of reading comprehension on measuring those skills (see Fig. 1). All participants answered Health LiTT items on a touchscreen laptop computer. To reduce respondent burden, we separated the item bank into six overlapping subsets of 30 Health LiTT items. The six subsets were administered sequentially (i.e., in order of patient enrollment) to obtain equal numbers of completions for each subset. See Yost et al. and Hahn et al. for more detail on the parent study [1,2].

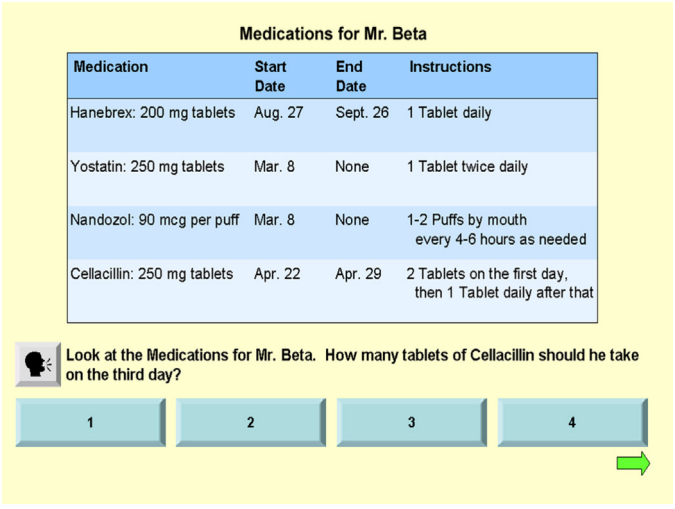

Fig. 1. Example Health LiTT document item.

The respondent may touch a sound icon on the screen to hear the audio as many times as needed. An answer is selected by touching one of the response buttons. Once selected, the button changes in color providing visual confirmation of the chosen response. The respondent then advances to a new screen for the next question. Health LiTT is based on a calibrated item bank of 82 items, and health literacy is scored on a *T*-score scale that has a mean of 50 and standard deviation of 10 in the calibration sample [1]. Higher scores indicate higher levels of health literacy.

The primary objective of the parent study was to assess the psychometric properties of the Health LiTT item bank [14]. Cognitive ability was included as a potential covariate for secondary analyses. As it was not a critical variable for the parent study, we investigated very brief tools for measuring cognitive impairment. We selected the Mini-Cog screening tool consisting of a delayed three-item word recall task (WRT) measuring short-term memory and a clock drawing task (CDT) measuring visuospatial skills. Sensitivity and specificity for the Mini-Cog to identify dementia are 75% and 89%, respectively in the general population [15] and 99% and 93%, respectively among elderly [16]. Since the Mini-Cog is a screening tool, participants in our study should not be deemed "cognitively impaired" without additional testing [17]. Rather, they should be considered as having "screened positive" for cognitive impairment.

The WRT score can range from 0 = no words recalled correctly to 3 = all words (apple, table, penny) recalled correctly; therefore, a low WRT score indicates cognitive impairment. The clock drawings were scored by two independent, experienced psychometrists using the four-point Consortium to Establish a Registry for Alzheimer's Disease (CERAD) scoring where 0 is normal and 1–3 represent increasing levels of cognitive impairment [18,19]; thus, a high CDT score indicates cognitive impairment. Clock drawings for 30 participants were scored by both psychometrists and discussed for purposes of calibrating their scoring; these drawings were excluded from the inter-rater reliability analyses. If inter-rater reliability for the remaining CDT drawings was high, defined as a weighted kappa > 0.74 [20], then the CDT score of the more senior psychometrist was used in determining the overall Mini-Cog score for a patient. If the inter-rater reliability was not high, the average of the CDT scores from the two psychometrists was used. The WRT and CDT scores were combined using the algorithm described by Borson et al. [16] to yield an overall Mini-Cog classification of 0 = normal versus 1 = cognitively impaired. Specifically, if a person recalls all three words correctly, s/he is classified as having normal cognitive function (i.e., negative screen). If all three words are missed, the person is classified as cognitively impaired (i.e., positive screen). The clock drawing is only considered in the Mini-Cog scoring algorithm if a person recalls one or two words, in which case a normal clock drawing (score = 0) leads to a classification of normal cognitive function (i.e., negative screen) and an impaired clock drawing (score = 1, 2 or 3) leads to a classification of cognitively impaired (i.e., positive screen).

Standard sociodemographic and clinical variables were obtained via interviewer-administered questionnaires. Education was measured as the highest grade level completed and then categorized for purposes of analysis. Health status was measured with the global mental health and global physical health scales from the Patient-Reported Outcomes Measurement Information System (PROMIS) [21]. These two global scales are scored on a *T*-score scale, with a mean of 50 and a standard deviation of 10 in the general population. Higher global scores indicate better health.