The METER: A Brief, Self-Administered Measure of Health Literacy

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BACKGROUND: Given rapidly accumulating evidence that health literacy is correlated with important health-related measures, assessing patients' health literacy level is of increasing concern for researchers and practitioners. Practical limitations for use of existing health literacy measures include length of time and practitioner involvement in administration.

OBJECTIVE: To develop and validate a brief, self-administered measure of health literacy, the Medical Term Recognition Test (METER).

PARTICIPANTS: 155 participants were recruited from an outpatient cardiology program at an urban hospital.

MEASURES: Patients completed measures of health literacy (METER and REALM), neuropsychological function, psychosocial health, and self-report questionnaires about health behaviors. Indicators of cardiovascular health were also recorded from patients' medical charts.

KEY RESULTS: The measure took 2 min to complete. The internal consistency of the METER was 0.93, and it correlated highly with REALM (r=0.74). Regarding sensitivity and specificity for identifying individuals below REALM's cutoff for functional literacy, METER resulted in 75% correct identifications and 8% false positives. METER and REALM were both associated with various health-related measures (including significant correlations with measures of neuropsychological function and cardiovascular health).

CONCLUSIONS: These initial findings show that the METER is a quick and practical measure of health literacy for use in clinical settings.

KEY WORDS: health literacy; METER; REALM; cardiovascular health.
J Gen Intern Med 25(1):67–71
DOI: 10.1007/s11606-009-1158-7

INTRODUCTION

Health literacy is "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions."[1] Assessing patients' health literacy is of increasing concern for researchers and practitioners, given rapidly accumulating evidence that health literacy is correlated with health-related measures. A recent meta-analysis reported that lower levels of health literacy are associated with poorer global health status, higher rates of hospitalization, decreased use of preventive and early detection procedures (e.g., mammography), poorer adherence to medication regimens, poorer disease management (e.g., poorer glycemic control), and lower levels of knowledge about chronic disease, health outcomes, and health services.[2]

A startling proportion of patients have low functional health literacy,[3–5] and many do not admit they have reading problems.[3] The National Work Group on Literacy and Health (1998)[6] cautioned health care providers not to assume they can recognize patients with poor literacy, and research shows that physicians often have difficulty identifying patients with low health literacy.[7] Accordingly, many advocate that health literacy be directly assessed to help identify patients who may be at greater risk for poorer health outcomes.[2,6] Given that successful management of many acute or chronic health conditions is influenced by patients' understanding of relevant health information, providing additional support to individuals who may have difficulty understanding this information can positively influence health outcomes.

The two most commonly used measures are the Test of Functional Health Literacy in Adults (TOFHLA, or the shortened S-TOFHLA)[8,9] and the Rapid Estimate of Adult Literacy in Medicine (REALM).[10] The two measures correlate with one another and with various health-related measures.[2] However, the administration methods for these measures have some practical limitations for use in clinical settings. TOFHLA involves written tests that are self-administered but require 22 min to complete; although shorter, the S-TOFHLA typically still requires around 7 min. REALM only requires about 2 min to complete; however, it is not self-administered. REALM requires patients to read a list of words aloud, and a practitioner must be present to score pronunciation accuracy. Other issues with REALM administration concern potential embarrassment of low-literacy patients from struggling to read words in front of another individual (many patients with low literacy report feeling ashamed of their reading problems)[3] and ambiguities in scoring (e.g., mispronunciations due to sinus/throat infections or speaker's accent).

To address these limitations, the present research introduces a short, self-administered measure of health literacy, the Medical Term Recognition Test (METER). The patient is given a list of items and is simply asked to check off those they recognize as actual words, and, like the REALM, it only takes about 2 min to complete. The format of METER is based on a battery of tests developed to estimate readers' prior reading experience.[11] For example, in the Author Recognition Test (ART), readers see a list of names and check off names that

Received March 18, 2009
Revised September 1, 2009
Accepted October 8, 2009
Published online November 3, 2009

they recognize as authors of popular fiction. Despite potential concerns about face validity of the task, performance on ART and similarly formatted measures correlates highly with vocabulary knowledge, reading comprehension, verbal fluency, and cultural literacy.[11]

Given that METER includes many words from REALM, we predicted the two measures would correlate highly. To further establish the validity of METER, we also compared associations of the two health literacy measures with various health-related measures. We were particularly interested in measures of cognitive functioning and cardiovascular health because cognitive limitations would be expected to limit an individual's ability to learn health-related information that is important for managing chronic conditions such as cardiovascular disease (cf. diabetes and other chronic diseases studied in prior health literacy research).[2,4,7]

METHODS

Setting and Study Participants

Patients referred for a perfusion stress scan as part of an outpatient cardiology program at Akron City Hospital were approached by the experimenter in the waiting room. Participants completed an informed consent form, gave permission for experimenters to access their medical charts, and completed a battery of tests. Each participant received a $10 gift card. The study protocol was approved by the institutional review boards of Kent State University and Summa Health System.

Measures

Health literacy. METER includes 40 medical words and 40 nonwords. The patient is asked to mark only those items they recognize as actual words (see Appendix), and it takes 2 min to complete. REALM includes a list of 66 medical words, and the patient is asked to read each word aloud.

Self-reports. Participants completed measures of depression (Beck Depression Inventory, BDI[12]), anxiety (State/Trail Anxiety Inventory, STAI[13]), physical activity (Rapid Assessment of Physical Activity, RAPA[14]), social support (ENRICHD Social Support Scale[15]), healthy eating habits (Starting the Conversation[16]), and cigarette smoking.[16]

Table 1. Demographic Characteristics of the Sample and Performance on Measures of Interest

	N [a]	M (SD)	Range
Demographic characteristics			
Age (years)	153	62.7 (11.9)	29–88
Gender = 76.5% male	153	N/A	N/A
Race/ethnicity = 92.6% White	148	N/A	N/A
Education (years)	141	14.1 (2.7)	6–23
Marital status = 87.5% married	120	N/A	N/A
Health literacy			
METER (out of 40)	154	36.1 (5.0)	14–40
REALM (out of 66)	150	62.2 (6.5)	28–66
Neuropsychological function			
Complex Figure Test–copying	155	27.2 (5.4)	11–36
Complex Figure Test–delayed recall	155	12.8 (6.0)	0–29
Trail Making Test A and B–time (seconds)	155	62.8 (29.0)	23.5–190.5
Trail Making Test A and B–number of errors	155	0.5 (0.7)	0–4.5
Mini-Mental State Examination	154	27.8 (5.4)	11–30
Cardiovascular health			
Maximum METs	145	9.6 (3.2)	1–16.2
Heart rate recovery at 2 min[b]	122	33.6 (14.4)	4–69
Heart rate recovery at 4 min[b]	116	45.1 (16.9)	5–88
Resting systolic blood pressure	138	138.2 (21.2)	96–208
Resting diastolic blood pressure	137	80.4 (10.0)	52–110
Self-reported health behaviors			
Starting the conversation[c]	125	6.7 (2.1)	1–13
RAPA strength exercise = 35.7% yes	140	N/A	N/A
RAPA flexibility exercise = 44.3% yes	140	N/A	N/A
RAPA aerobic exercise	141	5.1 (1.7)	0–7
Current smoker = 10.1% yes[d]	139	N/A	N/A
Psychosocial health			
Beck Depression Inventory[e]	138	4.4 (3.7)	0–19
STAI–state anxiety[f]	136	30.9 (10.6)	20–75
STAI–trait anxiety[f]	127	34.8 (7.9)	23–60
Social Support Scale[g]	138	25.9 (4.8)	9–30

[a]*Some participants did not complete all measures or chose not to respond to some questions*
[b]*Recovery is computed as heart rate at 0 min after completion of the stress test minus heart rate at time t min after completion. Higher values indicate better recovery*
[c]*Lower values indicate healthier eating habits*
[d]*'Yes' = smoked at least part of a cigarette in the past 7 days*
[e]*Lower values indicate fewer depressive symptoms*
[f]*Lower values indicate lower anxiety*
[g]*Higher values indicate better social support*

Neuropsychological function. Participants completed a brief test battery consisting of commonly used neuropsychological measures, including the Mini-Mental Status Examination (MMSE),[18] Trail Making Test A and B (measures visual attention, psychomotor speed, and speeded executive function),[19], and the Complex Figure Test (measures visuospatial skills and nonverbal memory).[20]

Procedures

These measures were administered as part of a larger collection of self-report and neuropsychological measures. The measures of interest here were administered in the following order: demographics questionnaire, METER, Complex Figure Test–copying, Trail Making Test, Complex Figure Test–delayed recall, MMSE, REALM, BDI, Social Support Scale, STAI, cigarette smoking self-report, Starting the Conversation, and RAPA. Demographic and medical characteristics were obtained through a medical chart review. Key medical variables included data from a perfusion stress test, including maximum METs, heart rate at 0, 2, and 4 min after termination of the stress test, and resting blood pressure.

Scoring

In the analyses below, METER was scored as the number of words correctly recognized. We also performed analyses using an adjusted METER score (number of words correctly marked minus number of nonwords marked), and results were highly similar. We report results using the unadjusted score because this scoring method is faster and easier for clinical settings and because it is comparable to the unadjusted scoring method for the REALM (based only on number of words correctly pronounced).

RESULTS

Demographic characteristics of the sample and performance on each measure are summarized in Table 1.

Reliability. METER showed a high degree of reliability, Cronbach's alpha = 0.93.

Construct validity. METER was strongly correlated with REALM ($r=0.74$, $p<0.001$). We also examined METER scores as a function of categorical level of health literacy, according to REALM's cutoff points: REALM scores of 0–44 are associated with reading ability at or below 6th grade level (low literacy), 45–60 are associated with 7th–8th grade level (marginal literacy), and 61–66 are associated with 9th grade or above level (functional literacy).[10] For patients with METER scores of 0–20, 83% had low literacy REALM scores and 17% had marginal literacy scores. For patients with METER scores of 21–34, 68% had marginal literacy REALM scores and 32% had functional literacy scores. For patients with METER scores of 35–40, 1% had low literacy REALM scores, 7% had marginal literacy scores, and 92% had functional literacy scores. Regarding sensitivity and specificity for identifying individuals below REALM's functional literacy level, METER resulted in 75% correct identifications and 8% false positives.

Predictive validity. To further establish the validity of METER, associations of METER and REALM with various health-related measures are reported in Table 2. With few exceptions, the magnitude of the associations between METER and the medical variables, health behaviors, and neuropsychological measures were similar to the magnitude of the associations between REALM and these measures.

Table 2. Correlations of Health Literacy Measures with Health-Related Variables

	METER		REALM	
	r	*p* (df)	*r*	*p* (df)
Neuropsychological function				
Complex Figure–copying	0.21	0.005 (154)	0.21	0.005 (150)
Complex Figure–recall	0.16	0.027 (154)	0.07	0.192 (150)
Trail Making–time	-0.42	< 0.001 (154)	-0.42	< 0.001 (150)
Trail Making–errors	-0.14	0.038 (154)	-0.23	0.003 (150)
Mini-Mental State Examination	0.53	< 0.001 (154)	0.54	< 0.001 (150)
Cardiovascular health				
Maximum METs	0.12	0.075 (144)	0.15	0.040 (141)
Heart rate recovery at 2 min	0.21	0.009 (121)	0.24	0.004 (118)
Heart rate recovery at 4 min	0.18	0.027 (115)	0.25	0.004 (112)
Resting systolic BP	-0.03	0.386 (137)	-0.04	0.334 (134)
Resting diastolic BP	-0.13	0.061 (136)	-0.16	0.034 (134)
Self-reported health behaviors				
Starting the conversation	-0.05	0.280 (124)	-0.13	0.079 (122)
RAPA strength exercise	0.13	0.060 (139)	0.20	0.009 (137)
RAPA flexibility exercise	0.14	0.049 (139)	0.10	0.130 (137)
RAPA aerobic exercise	-0.06	0.250 (140)	0.01	0.472 (138)
Current smoker	-0.09	0.139 (138)	-0.15	0.046 (136)
Psychosocial health				
Beck Depression Inventory	-0.03	0.369 (137)	-0.06	0.240 (135)
STAI–state anxiety	-0.12	0.085 (135)	-0.10	0.136 (133)
STAI–trait anxiety	-0.09	0.161 (126)	-0.12	0.102 (124)
Social Support Scale	0.15	0.040 (137)	0.19	0.015 (136)

DISCUSSION

This study provides initial evidence that the METER is a practical measure for assessing patients' health literacy in clinical settings. The METER is administered as quickly as the REALM, with minimal instructions and involvement of practitioners, and it correlates highly with REALM.

The study also further establishes health literacy as a correlate of mental and physical health. Few prior studies have examined associations between health literacy and markers of cardiovascular health or cognitive functioning. In the current study, better test performance on the METER was associated with better neuropsychological test performance and better cardiovascular health.

Among limitations of the study, participants were relatively high-functioning individuals compared to levels of health literacy observed in previous studies. Larger scale studies involving more heterogeneous samples will be useful to further examine the association between METER and other measures of health literacy. Although the current study suggested METER performance cutoff points of 0–20, 21–34, and 35–40 to demarcate low, marginal, and functional health literacy levels, additional work will be useful to further establish the adequacy of these cutoff points. However, METER's quick and easy administration method will be useful not only in clinical settings, but will also facilitate inclusion in future health literacy studies. Finally, we note that health literacy is not limited to vocabulary knowledge, but also encompasses individuals' ability to acquire, understand, and use health information. Although METER and REALM do not directly assess these other competencies, to the extent that these brief measures correlate with performance on more extensive indicators of health literacy, they are useful for identifying patients who may need additional evaluation or support for understanding and using health information.

Acknowledgements: *Thanks to Rochelle O'Neil for assistance with data scoring. This work was supported in part by a James S. McDonnell Foundation 21st Century Science Initiative in Bridging Brain, Mind and Behavior Collaborative Award (KR), by awards DK075119 and HL039311 (JG), and by award R21 AT002698-01 A2 (JH).*

Conflict of Interest: *None disclosed.*

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APPENDIX: METER INSTRUCTIONS AND ITEMS

The following list contains some real medical words. For example, some of the words have to do with body parts or body functions, kinds of diseases, or things that can make your health better or worse. The list also contains some items that may look or sound like medical words but that are not actually real words.

As you read through the list, put an "X" next to the items that you know are real words.

You should not guess. Only put an "X" next to an item if you're sure it's a real word.

_____ Irrity	_____ Inlest
_____ Arthritis	_____ Pollent
_____ Obesity	_____ Malories
_____ Flu	_____ Cancer
_____ Behaviose	_____ Alcoheliose
_____ Syphilis	_____ Antibiotics
_____ Potassium	_____ Antiregressant
_____ Hormones	_____ Colitis
_____ Nerves	_____ Diabetes
_____ Pilk	_____ Occipitent
_____ Rection	_____ Nausion
_____ Blout	_____ Impetigo
_____ Boweling	_____ Menstrual
_____ Exercise	_____ Abghorral
_____ Pustule	_____ Seizure

_____ Cerpes
_____ Kidney
_____ Emergency
_____ Potient
_____ Menopause
_____ Diagnosis
_____ Depretion
_____ Jaundice
_____ Gallbladder
_____ Miscarriage
_____ Appendix
_____ Fam
_____ Infarth
_____ Dose
_____ Hemorrhoids
_____ Testicle
_____ Eye
_____ Midlocation
_____ Insomniate
_____ Bloodgatten
_____ Hepatitis
_____ Astiringe
_____ Nutral
_____ Asthma
_____ Inflammatory
_____ Anemia
_____ Allagren
_____ Prognincy
_____ Stress
_____ Ellargic
_____ Sexually
_____ Pelvince
_____ Vaccilly
_____ Prescription
_____ Germs
_____ Gonorrhea
_____ Tumic
_____ Fatigue
_____ Osteoporosis
_____ Constipation