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Investigating the Association of Health Literacy With Health Knowledge and Health Behavior Outcomes in a Sample of Urban Community College Undergraduates

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Background: There is a paucity of evidence associating health literacy metrics with adults' enhanced health knowledge, health status, health practices, or health behaviors. **Purpose:** Investigate whether health-literate undergraduates exhibit enhanced health knowledge, health status, health practices, or behaviors compared to non-health-literate cohorts. **Methods:** A convenience sample of 362 urban undergraduates responded to (1) Short Test Functional Health Literacy in Adults, (2) Health Knowledge Inventory, and (3) the American College Health Association's (ACHA) National College Health Assessment. **Results:** Only 4 of 78 variables discriminated between subjects rated health literate and not health literate. Three of the 4 discriminating variables had a negative association between adequate health literacy and positive health outcomes. **Discussion:** There was no difference between undergraduates who qualified as health literate and not health literate in (1) a minimal standard of health knowledge; (2) positive health practices; (3) positive health behaviors; or (4) health status. **Translation to Health Education Practice:** Recommendations: (1) *health literate* should be replaced with the functional intervention of *health educated* in the nation's priorities for improving health outcomes; and (2) state governments should capitalize on preexisting public/higher education infrastructures to deliver health education to the nation's population to remediate health disparities, improve health outcomes, and address national health outcome objectives.

BACKGROUND

Health literacy is broadly defined as the ability of people to obtain and understand health information and apply it to their lives in an effort to prevent disease and make health decisions.[1] Scholars identify health literacy as a primary factor in enabling persons to interact with and navigate the health care system; communicate their needs to providers; engage in self-care and chronic disease/disorder management; adopt health-promoting behaviors; and base health decision making on advancing scientific health and medical knowledge.[2-9] Government agencies[10] assert that health literacy is a key factor in achieving positive health outcomes, reducing health disparities, and reducing health care costs in America.

Research reports that persons with limited health literacy have markedly higher patient utilization rates in primary care, surgery, and emergency services[11,12]; underutilize preventive health care services; and are more likely to be noncompliant in addressing medical directives.[12] The mean annual health care cost of those with low health literacy is 4 times greater than that of the general population of the United States.[13] However, a confounding factor in this relationship is the associative variables of socioeconomic status—with poor socioeconomic status generating increased health care costs. With this in mind, health care policymakers and practitioners have qualified health literacy as a priority for the United States—linking health literacy to positive health outcomes and identifying health literacy as a critical component for successful health care reform.[10,13-15]

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The term health literacy was advanced 3 decades ago and scholars have yet to codify health literacy within a health behavior model that forecasts positive health outcomes.[16-18] The genesis of health literacy is rooted in developmental English literacy education and clinical practice relative to patient compliance and utilization of medical systems.[8] However, the concept of health literacy can and should encompass the knowledge, skills, and behaviors of people who are not currently under formal medical care as a way to improve health outcomes through self-care and the promotion of healthy behaviors. Thus, scholars have proposed a public health–based model of health literacy that includes not only patient involvement in the medical system but also the ability to understand and apply information on risk factors to health and determinants of health.[1,19]

To date, proposed constructs of health literacy include (1) a minimal level of proficiency in English reading, writing, and communication; (2) health cognition—that is, knowledge of scientific concepts based health and medical terminology; (3) the ability to determine the validity of scientific information; and (4) the capacity to obtain, process, and understand the basic health information and services needed to make appropriate health decisions.[1] In turn, health literacy's assigned role is to enable adults to (1) navigate and interact with the health care system; (2) communicate their needs to providers; (3) engage in self-care; (4) adopt health-promoting and disease prevention behaviors; and (5) base health decision making on sound health and medical knowledge. Health literacy is presumed to drive an individual's health decision making toward positive health outcomes (Figure 1).

Given the constructs of health literacy as well as health literacy's historical priority in the nation's public health goals, there is little evidence associating health literacy metrics with adults' enhanced health knowledge, enhanced health status, or health-promoting behaviors—other than medical behaviors like cancer screening. Furthermore, there is little research on health literacy's impact on adolescents' and young adults' health knowledge, health status, and health behaviors—although Internet health literacy has been studied.

PURPOSE

The current study examined whether health-literate adolescents and undergraduates in a college setting

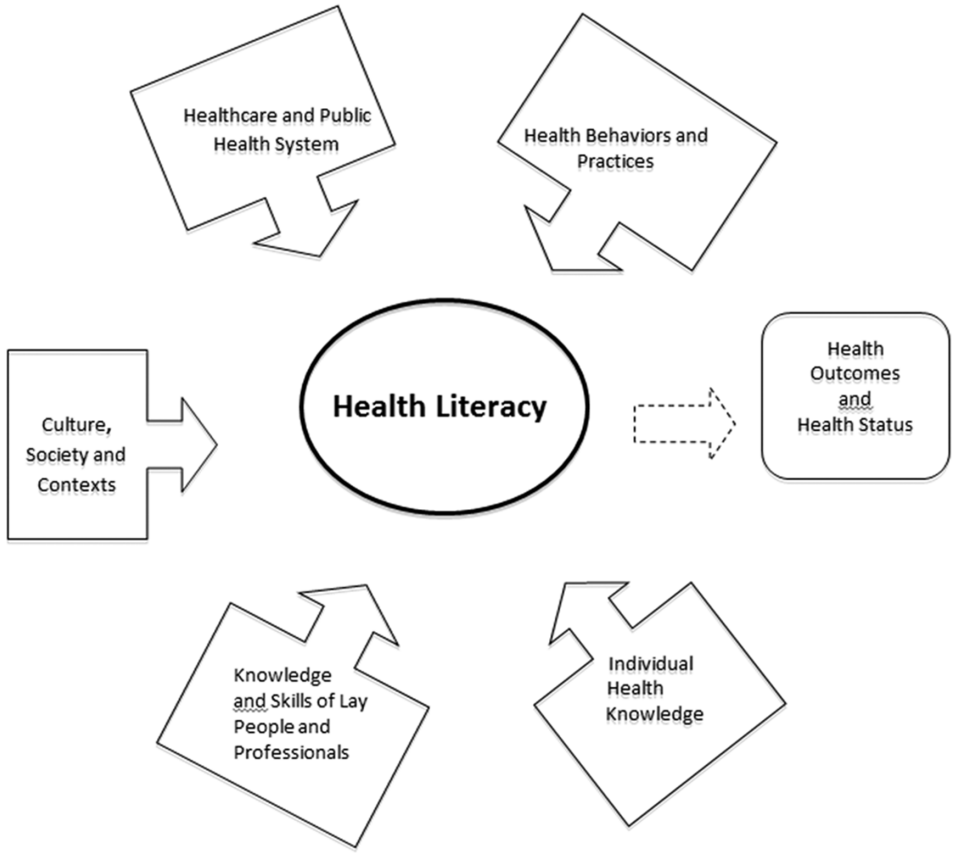

FIGURE 1 Health literacy framework.[1]

exhibited enhanced health knowledge, health status, health practices, or health behaviors when compared to their cohorts rated as not health literate. The investigation hypothesized that there is no relationship between undergraduates qualifying as health literate and their health knowledge, health status, health practices, and health behaviors.

METHODS

In order to focus on a population most likely to emulate the profile of adults exhibiting limited health literacy, as well as the demographics most associated with poor health status and poor health outcomes, an urban community college predominantly enrolled with minority undergraduates was selected for the study.

Measures

The instrument package consisted of the following:

1. A demographic survey measuring age, sex, race/ethnicity, U.S. origin of birth, international student status, languages spoken at home, grade point average, and credits earned.
2. The Short Test of Functional Health Literacy in Adults (S-TOFHLA) is a 36-item timed reading comprehension test that uses the modified cloze procedure, in which every fifth to seventh word in a passage is substituted with a blank space.[20] The S-TOFHLA rates health literacy scores as *adequate health literacy* (scores = 23–36); *marginal health literacy* (scores = 17–22); or *inadequate health literacy* (scores = 0–16). The S-TOFHLA has a reported Cronbach's alpha of .97 for reading comprehension items.[21] The S-TOFHLA yielded a Cronbach's alpha of .71 for the current study's sample.
3. The American College Health Association's National College Health Assessment (ACHA-NCHA) collects data on subjects' demographics, health status, health behaviors, and health practices. The ACHA-NCHA is a validated and reliable instrument examining health status, various health behaviors, and practices regarding alcohol, tobacco, other drugs, sexual health, weight, nutrition, exercise, and mental and emotional health.[22,23] The ACHA-NCHA yielded a Cronbach's alpha of .68 for the items examined in this study.
4. The Health Knowledge Inventory (HKI) is a 110-item instrument that assesses undergraduates' health knowledge in 11 health cognition areas. The test–retest reliability coefficient of the HKI has ranged from 0.81 to 0.88 and the internal consistency coefficient has ranged from 0.77 to 0.91.[24-26] This study examined 5 of the 11 subscales of the HKI (Consumer Health, Human Sexuality, Mental Health, Nutrition, Substance Use and Abuse) that were directly related to the ACHA-NCHA health behaviors and practices under investigation. The HKI yielded a Cronbach's alpha of .89 for the 5 subscales examined in this study.

A pilot study was conducted to (1) simulate the proposed data collection protocol; (2) conduct a postsurvey focus group to elicit feedback on data collection; and (3) conduct a mock data analysis for the purpose of calculating a power of analysis. In response to the pilot study, the data collection protocol was modified to increase clarity of directions and reduce the estimated instrument package completion time to an average of 90 minutes. Power of analysis estimates are limited when applied to a convenience sample. However, the power of analysis for this investigation was calculated using a margin of error of 5%, confidence level of 95%, and response distribution of 50%, which is the most conservative rate demonstrated by the pilot study respondents. The result was a required sample size of 378.

A convenience sample of 390 students was constituted from eligible undergraduates enrolled in the college's general studies health education survey course (HED-100). The HED-100 course is a required general studies course for all degree programs at the college from accounting to theater arts with the exception of the allied health and nursing degree programs. As a result, none of the participants had a demonstrated academic interest in health or the health professions. Eligible participants were matriculated undergraduates who read at or above the fifth-grade reading level and were English speakers or had completed the requisite English-language remedial course (s) to qualify as English speakers/readers. Participants completed the instrument package in the first week of class meetings prior to any classroom course instruction.

Of the 390 undergraduates approached, 366 consented to participate in the study and submitted their survey instruments. Twenty-four subjects declined to participate and were assigned a course study guide by their professor while participating subjects completed the instrument package in class. There were 4 subjects with missing data for the S-TOFHLA. Given health literacy as the independent variable, these subjects were removed from the analysis, thus creating a study sample of 362.

ANALYSIS

Data were analyzed using SPSS version 20 (IBM, Armonk, NY). Descriptive analyses were conducted using the mean/median and standard deviation for continuous measures (e.g., age) and proportions for ordinal or nominal measures (e.g., health status). Associations were tested using the *t* test when comparing means in 2 groups, the chi-square test when

comparing proportions, and analysis of variance when comparing means in several groups. Missing data on any variables under analyses were deleted list-wise. For analysis of differences in health knowledge, health status, health practice, and health behavior based on health literacy, subjects were grouped into one of 2 levels of the variable based on their S-TOFHLA scores; either health literate (scores of 23 or above) or not health literate (scores of 22 or less).

Given the length of the instrument package and the comprehensiveness of the NCHA (in that it was likely respondents had not participated in all of the health practices or behaviors chronicled in the NCHA), there were notable missing data. We tested for significant differences between subjects who completed the instrument package fully (i.e., demographic survey, S-TOFHLA, HKI, and select items on NCHA; $N = 149$) and those who did not ($N = 217$). The results are reported in Table 1. There was a significant difference in number of earned credits and being born in the United States between the groups. We judged this difference as a reflection of upper classmen's greater ability and experience to perform on a timed battery of instruments as well as native English speakers/readers' greater ability and experience to perform on a timed battery of English-language instruments. (Further attention to this difference is reported in the Discussion section.)

TABLE 1
Demographics Comparison of Subjects Who Did and Did Not Complete the Instrument Package

Characteristics	*Complete Instrument Package (*N = *149)*	*Incomplete Instrument Package (*N = *217)*
Female (%)	56.4	58.4
Race/ethnicity (%)		
White	7.4	13.0
Black/African American	30.2	28.3
Hispanic or Latino/a	53.0	50.4
Asian or Pacific Islander	9.4	8.1
Other	0.0	0.2
Born in United States (%)	71.1*	57.9*
International student (%)	8.7	13.1
Languages spoken at home (%)		
One	62.4	55.4
Two	37.6	44.6
Age, mean ± SD (median)	21.62 ± 6.08 (20.0)	21.40 ± 5.90 (20.1)
Number of credits earned (mean ± SD)	18.44 ± 18.68**	13.46 ± 16.12**
Grade point average (mean ± SD)	2.60 ± 1.139	2.66 ± 1.319

*$P < .05$. **$P < .01$.

RESULTS

Demographics

The study sample's ($N = 362$) demographics and select sample variables (i.e., S-TOFHLA categories, health status, body mass index [BMI]) are reported in Table 2. The sample's mean age was 21.55 years (median = 20.00). The study sample was 57.3% female. In terms of race and ethnicity, white subjects accounted for only 10.6% of the sample.

TABLE 2
Demographics of Study Sample and Select Variables[a]

Characteristics	*Statistical Descriptors*
Age (range 18–73), mean ± SD (median)	21.55 ± 6.01 (20)
Grade point average (range 0–4), mean ± SD (median)	2.56 ± 1.07 (3.00)
College credits completed (range 0–72), mean ± SD (median)	15.51 ± 17.37 (12.00)
Female (%)	57.3
Race/ethnicity (%)	
White	10.6
Black or African American	25.8
Hispanic or Latino/a	43.6
Asian or Pacific Islander	7.5
American Indian/Alaskan Native/Native Hawaiian	0.3
Biracial or multiracial	4.7
Other	7.5
Spoken languages at home (%)	
One	41.7
Two	58.3
Born in the United States (%)	63.4
International student status (%)	11.0
Mother's education (%)	
Grade school	24.2
High school	45.4
College	26.2
Post-college	4.2
Father's education	
Grade school	31.6
High school	44.7
College	20.5
Post-college	3.1
Primary source of health insurance	
College plan	1.7
Parent's plan	59.1
Another plan	23.6
Do not have health insurance	9.8
Not sure if I have health insurance	5.7
Health literacy (S-TOFHLA) (%)	
Adequate (23–36)	85.1
Marginal (17–22)	6.9
Inadequate (0–16)	8.0
Health status (%)	
Excellent	8.6
Very good	33.6
Good	39.3
Fair	16.1
Poor	1.8
BMI (%)	
Underweight (<18.5)	5.6
Desired weight (18.5–24.9)	49.3
Overweight (25–29.9)	28.4
Obese (>30.0)	16.7

[a] S-TOFHLA indicates Short Test of Functional Health Literacy in Adults; BMI, body mass index.

Health Literacy Proficiency of Sample

Subjects were grouped into one of 2 levels of the variable based on their S-TOFHLA scores; either health literate (scores of 23 or above) or not health literate (scores of 22 or less). The grouping resulted in 85.1% ($N = 308$) of the subjects being classified as health literate and 14.9% ($n = 54$) being classified as not health literate.

Health Literacy Proficiency and Demographics

There was a significant difference in the age of subjects who qualified as health literate and those who did not ($t(191) = 3.435$, $P = .001$), as well as credits completed ($t(111) = 3.550$, $P = .001$). Health-literate subjects were 2 years older on average and completed about 6 credits more than their counterparts. There was a significant difference between the race/ethnicity of subjects qualifying as health literate, $\chi^2(3, N = 269) = 7.856$, $P = .049$; 7.7% of whites, 16.2% of blacks/African Americans, 12.9% of Hispanic-Latino/a subjects failed to qualify as health literate, and 33.3% of Asian or Pacific Islanders failed to qualify as health literate. No other demographic variables proved significantly different based on subjects' qualification of health literacy. There were no significant differences on self-reported health status or BMI for participants who were health literate and those who were not.

Health Literacy Proficiency and Health Knowledge

Table 3 compares the results of HKI scores between health-literate subjects and subjects rated not health literate. There was a significant difference between health-literate and non-health-literate subjects and their HKI total scores ($t(360) = 2.330$, $P = .020$) and their scores on the Consumer Health subscale ($t(360) = 2.486$, $P = .013$). Subjects who qualified as health literate scored significantly higher HKI total scores and Consumer Health subscale scores than their cohorts who did not qualify as health literate. The 4 remaining subscales proved not to be significantly different between the groups.

TABLE 3
Health Literacy Proficiency and HKI Scores[a]

HKI Categories	*Health Literate Mean ± SD*	*Not Health Literate Mean ± SD*	P *value*
HKI total score (range 0–50)	20.00 ± 8.374	17.17 ± 7.520	**.020**
Consumer Health subscale (range 0–10)	4.47 ± 2.076	3.72 ± 1.827	**.013**
Nutrition subscale (range 0–10)	4.99 ± 2.693	4.52 ± 2.238	.170
Mental Health subscale (range 0–10)	3.82 ± 2.139	3.33 ± 2.119	.120
Human Sexuality subscale (range 0–10)	3.29 ± 1.902	2.76 ± 1.565	.055
Substance Use/Abuse subscale (range 0–10)	3.43 ± 2.217	3.07 ± 1.941	.271

[a] HKI indicates Health Knowledge Inventory. *t* Tests were used to test differences between means.

Health Literacy Proficiency and Health Behaviors and Practices

There were no significant differences between participants who qualified as health literate and those who did not on the following weight management and nutrition variables: perception of weight, number of fruits/vegetables consumed per day, dieting in the last 30 days, exercising to lose weight in the last 30 days, number of days performing moderate exercise for 30 minutes, and number of days performing vigorous exercise for 20 minutes or performing strength training exercise.

Subjects reported whether they are 'trying to do anything about their weight' in 4 categories: (1) not trying to do anything; (2) stay the same weight; (3) lose weight; or (4) gain weight. There was a significant difference between health literate and not health literate subjects, $\chi^2(3, N = 326) = 8.367$, $P = .039$. More participants in the health-literate group reported not trying to do anything about their weight than those in the not health literate group (71.1% vs. 28.9%).

There were no significant differences between health-literate and non-health-literate participants on the following preventive health behaviors: dental exam or dental cleaning, testicular self-exam (males), breast self-exam (females), and gynecological exam (females).

There were no significant differences between health-literate and non-health-literate participants on the following psychological health variables: ever receiving mental health services from counselors, therapists, psychologists, psychiatrists, or college health services; experiencing difficulty or emotional trauma with academics, career-related issues, intimate relations, family problems, death of a family member, other social relationships, personal appearance, sleep difficulties, and finances; and ever being diagnosed or treated for depression, anxiety, panic attacks, substance abuse or addiction, or insomnia. Health-literate subjects were more likely to consider seeking help from a mental health professional in the future than non-health-literate subjects, χ^2 $(1, N = 304) = 4.378$, $P = .044$.

Subjects reported the overall level of stress they experienced in the last 12 months as $0 = no\ stress$, $1 = less\ than\ average\ stress$, $2 = average\ stress$, $3 = more\ than\ average\ stress$, and $4 = tremendous\ stress$. There was a significant difference between the reported levels of stress experienced in the last 12 months between the health literate ($\varphi = 1.77 \pm 1.015$) and not health literate

($\bar{\chi} = 1.24 \pm 1.246$) groups, $F(1) = 9.725$, $P = .002$, with the health-literate group reporting more stress.

There were no significant differences between health-literate and non-health-literate participants on the following substance use/abuse variables: use of cigarettes, water pipe (hookah), cigars, clove cigarettes, marijuana, alcohol; driving after drinking alcohol; number of hours partying while consuming alcohol; number of times consuming 5 or more drinks in one sitting; alcohol abuse behaviors; and use of nonprescribed pain killers.

There was a significant difference between health-literate and non-health-literate subjects and the number of alcohol drinks consumed the last time they partied ($t(317) = 2.356$, $P = .002$). Health-literate subjects consumed significantly more alcohol drinks the last time they partied than those who were rated not health literate ($\bar{\chi} = 2.55 \pm 2.990$) vs. ($\bar{\chi} = 1.40 \pm 1.959$).

There were no significant differences between participants who were health literate and those who were not on the following sexual behaviors and practices: number of sexual partners in the last 12 months; having vaginal, oral, or anal intercourse in the last 30 days; using barrier protection when having vaginal, oral, or anal intercourse in the last 30 days; using birth control to prevent pregnancy at last coitus; using emergency contraception in the last 12 months; and unintended pregnancy in the last 12 months.

DISCUSSION

The current study is interpreted in light of several limitations. It used a convenience sample in a highly ethnically diverse community college and cannot be generalized to all college students. The study used a cross-sectional design and no inference can be made about temporality of the constructs measured (i.e., whether health literacy preceded health behaviors and practices). Finally, many of the health behavior variables referenced participants' behaviors in the last 30 days to 12 months—thus relying on participants' recall. However, the use of previously validated and reliable measurement instruments, the fairly large sample, and the presence of participants who are considered traditionally underserved in health care are strengths of the study. Although the sample was not random, several demographic characteristics of students in the sample were similar to that of the population of the college; that is, the median age in the study was 20, and the median age in the college was 22. Likewise, about 43% of the sample was men and men included 42% of the college population. Finally, the sample had a higher percentage of Hispanics than the population of the college (53% versus 39%) but fewer Asian and white students. However, the overrepresentation of Hispanic students in the study sample may be viewed as a strength, because black and Hispanic adults are often understudied and underserved in health research and health promotion in the college setting.

Though 85.1% of the subjects were classified by the S-TOFHLA as health literate, 14.9% were classified as not health literate. The seemingly high rate of undergraduates classified as not health literate reflects the academic preparation of freshmen at this participating open enrollment, urban community college. By example: (1) 91% of first-time freshmen are registered for noncredit remedial courses; (2) 65% of first-time freshmen are in noncredit remedial English-as-a-second-language courses; and (3) nearly 50% of all grades issued each semester at the college are either noncompletion grades or failures. In the college's remediation courses, undergraduates are provided concentrated instruction, coaching, laboratory tutoring, electronic dictionary aids, as well as ample time to complete their assignments. The college's English language reading/comprehension remediation classroom environment is the antithesis of the S-TOFHLA's test administration environment—which is a 7-minute timed test for 36 items—allowing for no English language reading/comprehension instruction, tutoring, or electronic dictionary aids.

Of the 78 demographic, health status, health knowledge, health practice, and health behavior variables examined, health literacy discriminated between only 8 variables. Health-literate subjects were significantly older and earned significantly more college credits than non-health-literate subjects. Age as well as academic success are associated with the literacy metric of the S-TOFHLA. There was a significant difference between the race/ethnicity of subjects qualifying as health literate with 7.7% of white, 16.2% of black/African American, and 12.9% of Hispanic-Latino/a subjects qualified as not health literate, compared to 33.3% of Asian or Pacific Islanders. It is reasonable to assume Asian or Pacific Islander undergraduates experienced a greater degree of difficulty than their cohorts in the S-TOFHLA testing environment, given the greater dissimilarity between their native or primary language and the English language.

Though we found that health-literate subjects scored higher overall on the HKI and on the Consumer Health subscale, their overall threshold of basic health knowledge was substandard by any measure. For the Consumer Health HKI subscale, health-literate subjects scored 48% correct. For the remaining HKI subscales, with the exception of the Nutrition subscale, health-literate subjects' mean scores were less than 38% of the cognitive items correct. Consequently, though health-literate subjects scored higher HKI (health knowledge) scores than their non-health-literate cohorts, their threshold of health knowledge in the 5 health cognition domains would not support an assumption of informed health decision making.

In terms of health status, health behaviors, and health practices, we found that participants who were health literate reported higher levels of stress, drank significantly

more alcohol the last time they partied, and were less likely to be doing something about their weight than those who were not health literate. The single variable that yielded a significant difference in a positive direction to health outcome was in the proportion of health-literate participants who would consider seeking help from a mental health professional in the future. Given the evidence, we concluded that there was no supportable difference between adults that qualified as health literate and those not qualified as health literate in (1) their command of an acceptable minimal standard of health knowledge; (2) reporting positive health practices; (3) demonstrating positive health behaviors; or (4) presenting a positive health status metric. A previous study testing the association between health literacy and physical health in seniors found a similar result—that is, the poor health correlation with lower health literacy was explained in large part by lower general cognitive levels and education levels.[26] Likewise, a weak association was found between health literacy and measures of physical health and depression, although health literacy was slightly correlated with patient activation; that is, a construct that measures whether patients feel motivated and confident in their ability to apply health knowledge and skills to their lives.[27] More research should focus on teasing out the separate influences of health literacy as it is currently defined (mainly based on understanding medical terminology) and the concept of patient activation.

In reflecting on the results of this study, the immediate concern is the content validity of the S-TOFHLA. Of the 308 subjects classified as health literate, 72.3% scored perfect of near perfect (≤ 2 items incorrect) S-TOFHLA scores. It is likely, especially when considering health literate students' higher ages and increased college credits earned, that these subjects possessed a greater command of English-language literacy in general. In turn, S-TOFHLA scores may lack sufficient variability to correlate significantly with the multitude of health knowledge, health practice, health behavior, and health status variables tested. A previous study has found that the S-TOFHLA may not be as sensitive in younger adult populations as a measure of health literacy.[28] In another mixed methods study, qualitative results showed that college students' cancer literacy and eHealth literacy did not reflect their high scores on health literacy measures, including the S-TOFHLA.[29]

That the S-TOFHLA does not utilize a construct of health knowledge is another content validity concern. Though there was a significant difference in health knowledge between the health-literate and non-health-literate subjects, their level of health knowledge was inadequate overall as well as for each subscale. The supposition that health-literate subjects had higher health knowledge scores because of their increased age, increased academic success, and in turn superior general reading skills is most tenable. However, the S-TOFHLA was incapable of assessing or inferring a minimal level of health knowledge competence for informed health related decision making. This is a key threat to the health literacy framework model.

A third concern is the criterion validity of the S-TOFHLA. With one exception, undergraduates rated health literate in this investigation were not distinguishable in their positive health behaviors or health practices from undergraduates not rated health literate. There was no evidence of concurrent validity in the key associative factors in the health literacy model; that is, health practices, health behaviors, health status, and especially health outcomes.

The lack of association between health literacy as measured by S-TOFHLA and health knowledge and positive health behaviors in the current investigation supports the call for broadening the definition of the concept of health literacy.[1,19] This also supports research in variant health behavior models reporting that clinicians and researchers need to be aware of the health education skills and abilities lacking from health literacy instruments' metrics.[30] In practice, health care and public health practitioners determine whether an adult can read and comprehend English at some minimal level (health literacy) and then apply health education in a narrow range of personal health as it pertains to utilizing the formal medical and health care system. For example, "What level of English proficiency and understanding of medical vocabulary is necessary for a gastrointestinal pre-admission patient to follow pre-admission instructions?" or "What level of English proficiency and understanding of medical vocabulary is necessary for pregnant teenagers to commence and continue prenatal care?" In reality, the *health* in health literacy is a metric of whether a person *can be* health educated—not that the individual is at any gradient or benchmark of *health educated*.

This is a key misconception perpetuated by the application of the term literacy to health literacy by instruments measuring English-language proficiency and void of the whole of the health cognition domains and skills necessary to support informed health decision making. The construct of health encompasses all of the dimensions of personal health, which is emotional, social, physical, spiritual, intellectual, and environmental. The inherent promise of the operant term health literate is that it qualifies a person as possessing the knowledge, skills, and motivation to acquire, comprehend, and base all health decision making on scientifically verified health knowledge. This is the epicenter of dissonance between the promising concept of health literacy grating against the inferential constructs of health literacy in the literature. As such, 3 decades of marketing health literacy's prowess to deliver positive health outcomes and improved health status is its inherent Achilles' heel.

Given that the functional literacy measure used in this study proved to be a deficient indicator of an undergraduate's basic command of health knowledge, it follows that

such literacy measures cannot infer a person's potential to apply health knowledge to execute informed health decision choices that improve his or her health status and in turn health outcomes. Undergraduates rated health literate in this investigation were not distinguishable in their health status. With one exception, undergraduates rated health literate in this study were not distinguishable in their positive health behaviors or health practices from undergraduates not rated health literate. With nearly 3 out of 4 health-literate subjects with perfect or near-perfect scores one would not expect that of the 78 health practice, health behavior, and health status variables tested only one would prove to be in a positive direction to health outcomes. When applying this investigation's findings to a reexamination of the model of health literacy, health literacy's (as a metric of English-language proficiency) path from the inputs of health knowledge, health practices, and health behaviors to positive health outcomes cannot be supported.

TRANSLATION TO HEALTH EDUCATION PRACTICE

A key observation of this study is that the ongoing national campaign delegating health literacy as the objective means to influence adults' health decision choices, health practices, and health behaviors to realize positive health outcomes represents an injudicious effort when health literacy is equated to functional English-language literacy. For more than 3 decades, scholars have defined adult health literacy as possessing (1) health knowledge in all facets of health; (2) the ability to determine the validity of scientific information; and (3) the skills and capacity to obtain, process, and understand basic health information to render informed health decision making. Based on these traits, scholars posit their association to positive health outcomes.

It is clear that what scholars have ostensibly identified as constructs of health literate are actually constructs of health educated. In reality, what the nation has been calling for over the past 3 decades is not a health-literate nation but rather a nation of health-educated adults. That is, for all adults to enjoy and possess (1) the ability to acquire scientifically valid health knowledge in the physical, social, spiritual, emotional, and intellectual domains; (2) the ability to apply health information to informed health decision making; and (3) the engagement of a healthward enterprise—that is, an ambition for lifelong personal health promotion.

Belcastro[31] identified key principles for health educators to embrace when promoting a healthward enterprise: (1) respecting the dignity and worth of each individual and (2) acknowledging the right of each student to choose freely his health behaviors. Health education and instilling the pursuit of a healthward enterprise in a person is not the indoctrination of a societal standard of predetermined health behaviors. Greenberg[32] referred to this philosophy as a "freeing" pedagogy to health education—allowing a person to make the best health decisions based on his or her needs and interests. By substituting health education and the pursuit of a healthward enterprise for health literacy in the health literacy behavioral model (Figure 1), a rational path from an individual's intrinsic and extrinsic factors to positive health outcomes is fashioned.

Based on the findings of the current study, we advance the following recommendations. Given that English-language functional literacy measures dubbed measures of health literacy cannot infer a person's level of health knowledge or infer a person's potential to apply health knowledge to execute informed health decision choices, it is recommended that the term health literacy be abandoned. It is recommended that policy makers and health practitioners redefine the term health literate to include concepts of health education and public health in the nation's priorities for improving the health status and health outcomes of the population, where health education is defined as a person commanding (1) the ability to acquire valid health information in the physical, social, spiritual, emotional, environmental, and intellectual domains; (2) the ability to apply health information to informed health decision making; and (3) the impetus to engage in a healthward enterprise; that is, an ambition for lifelong personal health promotion.

In terms of application, school health education including higher education taught by a professionally prepared health educator delivers a whole health education to a population of well persons who are at the developmental stages of forming their health practices, health behaviors, health skills, and valuing of health. The nation's public and private school systems as well as public and private higher education institutions educate tens of millions of students each academic year. The majority of these students are identified by governmental, nonprofit, and proprietary health agencies and concerns as most in need of formal school health and physical education. Ever-increasing numbers of nondomestic students and undergraduates are enrolled in U.S. public schools and colleges with not a single instructional minute of prior formal classroom health education. Concomitantly, ever-increasing numbers of native-born undergraduates enter degree programs via college enrollment and retention initiatives (e.g., general education diploma) with virtually no formal schooling in health education. There is a conspicuous need for the United States to address this raging health disparity.

In turn, it is recommended that regional, state, and federal governments capitalize on the preexisting public education and higher education infrastructures to health educate the nation's population to remediate health disparities and improve the population's health status and concomitantly health outcomes. It is recommended that regional, state, and federal governments markedly increase

funding and public resources to underwrite public school health education (K–12) as well as higher education health education for adults. Specifically it is recommended that the nation's objectives for *Healthy People* as well as the national and state education standards for elementary, secondary, and higher education set as a minimum (1) 26 classroom hours of direct health education by a professionally prepared health educator for each elementary grade level (K–6); (2) 65 classroom hours of direct health education by a professionally prepared health educator for each secondary grade level (7–12); and (3) 45 credit-bearing contact hours of health education by a professionally prepared health educator in the required general studies or liberal arts core requirements for all applied science, associate, and baccalaureate degree programs.

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