

The Association between Health-Related Problem Solving and Health Literacy Among Older Adults with Hypertension

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Introduction

- Health literacy, defined as the capacity to obtain, process and understand health information to make health decisions (Nielsen-Bohlman, et al., 2004), has been linked to patient self-care behaviors and health outcomes, especially among older adults with chronic illness (DeWalt et al., 2004).
- While health literacy couples patient abilities and task demands (Baker, 2006), we know little about these abilities and how they are deployed to accomplish key health tasks such as medication-taking.
- Health literacy is also related to broader cognitive abilities such as fluid ability (e.g., Levinthal et al., 2008), as predicted by theories of aging and comprehension (Stine-Morrow et al., 2006).
- Self-care activities such as taking medication may also require fluid ability (e.g., processing speed) and crystallized ability (e.g., vocabulary) to the extent they depend on comprehension, planning, and other complex cognitive activities.

Our study:



Our Predictions:

- Health literacy is associated with health-related problem solving performance among older adults.
- The association between health literacy and health-related problem solving can be mediated by cognitive ability.

Methods

146 adults (60-87 yrs old; 103 diagnosed with hypertension; 43 without chronic illness). 60% were female. 35% had high school or less education and 8% had less than adequate health literacy for both the REALM and the STOFHLA.

Explanatory Variables	Measures
Health Literacy	STOFHLA (Baker et al., 1999), REALM (Davis et al., 1993)
Fluid Ability (9 tasks) (Cronbach $\alpha=0.83$)	Processing speed : Letter and Pattern Comparison (Salthouse, 1991), etc.
	Working memory : Letter Number Sequencing (Wechsler, 1997)
	Inductive reasoning : Letter Sets Test (Ekstrom et al., 1976), etc.
Crystallized Ability (4 tasks) (Cronbach $\alpha=0.87$)	Visual spatial processing : Card Rotation Test, Hidden Pattern Test (Ekstrom et al., 1976)
	Verbal ability : Advanced Vocabulary, Extended Vocabulary (Ekstrom et al., 1976)
Hypertension Knowledge (Cronbach $\alpha=0.90$)	General literacy : NAART (Uttil, 2002), Author Recognition Test (Stanovich et al., 1992)
	Expanded version of Gazmararian et al. (2003) (see Chin et al., 2009)

Health Problem Solving Task (6 questions from Everyday Problem Solving (Marsiske & Willis, 1995))

NUTRITION INFORMATION PER SERVING		PERCENTAGE OF US RECOMMENDED DAILY ALLOWANCES (U.S. RDA)	
SERVING SIZE: 1 oz (28 gm)			
SERVINGS PER CONTAINER: 16			
WITH 1/2 CUP WTR	WITH 1/2 CUP WTR	VITAMIN C	4 10 10
VITAMINS A & D	VITAMIN D	THIAMINE	4 20 25
FORTIFIED SKM MILK	FORTIFIED WHOLE MILK	RIBOFLAVIN	4 15 15
		NICOTINIC ACID	25 15 15
		IRON	15 15 15
		VITAMIN D	15 15 15
		VITAMIN B6	15 15 15
		FOLIC ACID	25 25 25
		VITAMIN B12	25 25 25
		PHOSPHORUS	15 30 30
		MAGNESIUM	10 10 10
		ZINC	25 25 25
		COPPER	6 6 6
		PANTOTHENIC ACID	4 4 4

Part A Medicare Benefits			
SERVICE	1988	1989	1990
Inpatient Hospital Services	All but \$540 for first 90 days benefit period.	All but \$560 deductible for an unlimited number of days/calendar year.	All but Part A deductible for an unlimited number of days/calendar year.
Skilled Nursing Facility Care	100% of costs for first 20 days later a 3 day prior hospital confinement.	80% of Medicare reasonable costs for first 80 days per calendar year with out-of-pocket maximum requirement.	80% for first 8 days/calendar year.
	All but \$67.50 a day for first 100-day day.	Nothing beyond 100 days.	100% for 81-120 days/calendar year.

Nutrition Label (e.g., How many calories are added to a serving of cereal if whole milk is used instead of skim milk?)

Use of cough medicine (e.g., maximum # teaspoons you should take in 24 hours?)

Medicare Benefits Payment Schedule (e.g., Mr. Jones entered a nursing home on Jan 1 of 1990. How much did Part A Medicare pay for his care in July 1990?)

Results

I. Health-related Problem Solving

Average accuracy (proportion correct) for the 3 tasks was 0.63 (S. D. =0.23). Healthy older adults had higher scores (Mean=0.70; S.D.=0.18) than older patients with hypertension (Mean=0.60; S.D.=0.23) ($t(2,105.17)=-2.67, p<0.005$).

II. Correlations among Health-related Problem Solving and Other Abilities

Health Tasks Problem Solving	Age	Education	Fluid Ability	Crystallized Ability	STOFHLA	REALM	Hypertension Knowledge
	$r=-0.18^*$	$r=0.388^{**}$	$r=0.51^{**}$	$r=0.40^{**}$	$r=0.35^{**}$	$r=0.24^{**}$	$r=0.13$

Note: * $p<0.05$; ** $p<0.01$

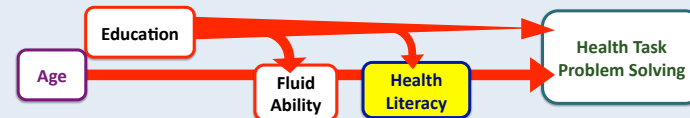
III. Cognitive Abilities Mediate the Association between Health Literacy and Health Tasks Problem Solving

Health tasks problem solving scores were analyzed in a regression with predictor variables entered in the following order: 1) Age, 2) Education, 3) Fluid ability, Crystallized Ability, 4) Health Literacy (STOFHLA, REALM).

- After entering fluid ability, health literacy didn't explain more variance of health task problem solving.
- In the final model, education and fluid ability were the most predictive variables.

Variable	Step 1	Step 2	Step 3	Step 4
Model R ²	2.3%*	17.1%**	28.3%**	28.3%**
Age	-0.174*	-0.185*	-0.087	-0.087
Education		0.390**	0.190*	0.187*
Fluid Ability			0.340**	0.333**
Crystallized Ability			0.129	0.124
STOFHLA				0.088
REALM				0.015

Our study confirmed an association between health literacy and health-related problem solving. More important, this relationship appeared to be mediated by cognitive abilities among older adults with hypertension. Age-related effects were also explained by cognitive ability.



Discussion

- Health literacy was associated with health problem solving performance among older adults, which is presumably an important component of self-care, which might lead to better health outcomes. The link between health literacy and problem solving in turn reflected broader cognitive abilities, primarily fluid ability.
- In our study, we also found that healthy older adults performed better in the health problem solving tasks than older patients with hypertension. Although our study was not designed to unravel causal relationships among problem solving ability and health outcome among older adults, we still found the health status measures (e.g., SF 36, comorbidity index, self-report health status, etc.) had significant correlations with patients' health problem solving abilities as well as their health literacy level which better health literacy and better health problem solving performance were associated with better health outcome. The link between health literacy, patients' problem solving/self care abilities and health outcomes should be investigated in future studies.