



Health Literacy, Cognition & Asthma Self-Management

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Acknowledgements

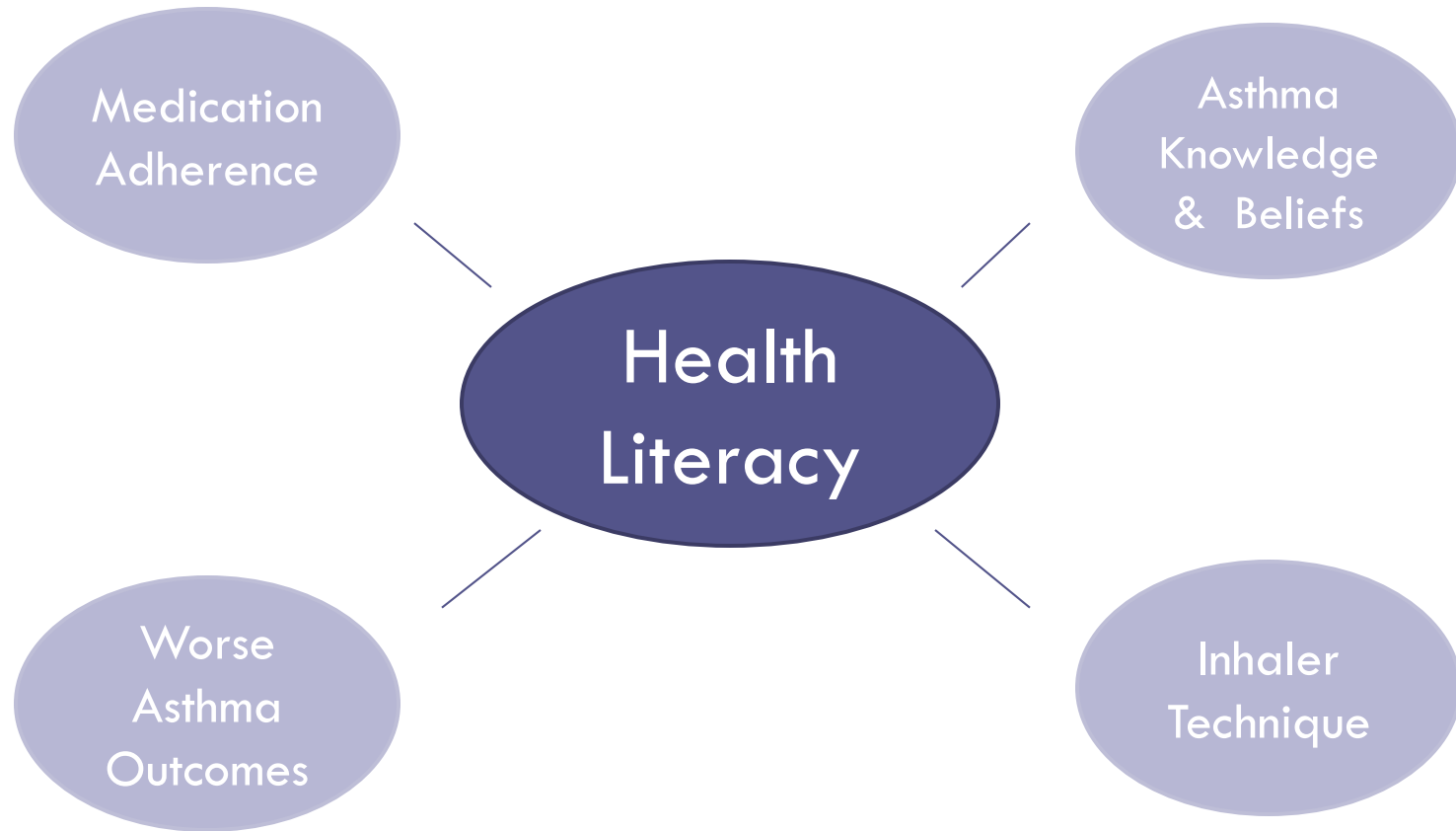
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- Juan Wisnivesky, MD DrPH MPH
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Asthma

- Chronic lung disease affecting ~25 million Americans
- Requires routine self-management
 - ▣ Adherence to controller medications
 - ▣ Proper use of inhaler devices
- Poor self management = worse clinical outcomes



Asthma and Health Literacy



Rosas-Salzar et al. *J Allergy Clin Immunol*. 2012 Federman et al. *J Asthma*, 2010

Federman et al. *J Asthma*. In press; Federman et al. *JAGS*, under review

Health Literacy and Cognitive Function



Literacy, Cognitive Function, and Health: Results of the LitCog Study

Michael S. Wolf, PhD MPH^{1,2}, Laura M. Curtis, MS¹, Elizabeth A. H. Wilson, PhD¹, William Reville, PhD³, Katherine R. Waite, BA^{1,2}, Samuel G. Smith, MSc⁴, Sandra Weintraub, PhD⁵, Beth Borosh, PhD⁶, David N. Rapp, PhD^{2,3}, Denise C. Park, PhD⁶, Ian C. Deary, PhD⁷, and David W. Baker, MD MPH¹

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BACKGROUND: Emerging evidence suggests the relationship between health literacy and health outcomes could be explained by cognitive abilities.

OBJECTIVE: To investigate to what degree cognitive skills explain associations between health literacy, performance on common health tasks, and functional health status.

DESIGN: Two face-to-face, structured interviews spaced a week apart with three health literacy assessments and a comprehensive cognitive battery measuring 'fluid' abilities necessary to learn and apply new information, and 'crystallized' abilities such as background knowledge.

SETTING: An academic general internal medicine practice and three federally qualified health centers in Chicago, Illinois.

PATIENTS: Eight hundred and eighty-two English-speaking adults ages 55 to 74.

to -26.4, p : with cognitive abilities: $\beta = -8.5$, 95 % CI -10.9 to -6.0).

LIMITATIONS: Cross-sectional analyses, English-speaking, older adults only.

CONCLUSIONS: The most common measures used in health literacy studies are detecting individual differences in cognitive abilities, which may predict one's capacity to engage in self-care and achieve desirable health outcomes. Future interventions should respond to all of the cognitive demands patients face in managing health, beyond reading and numeracy.

KEY WORDS: health literacy; cognitive abilities; health tasks; patient-reported outcomes; physical health; mental health.

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- Prior research found HL-cognitive function associations
- Wolf, et al (2012) found HL association with health tasks explained by cognitive function
- Minimal research has examined HL, cognitive function and self-care behaviors

Objective

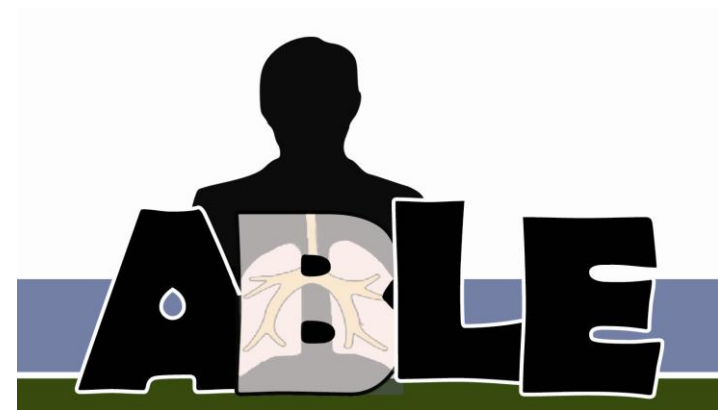
Investigate the degree to which cognitive function explains the association between health literacy and asthma self-management tasks among elderly asthmatics.



Study Design

Asthma Beliefs Literacy in the Elderly (ABLE)

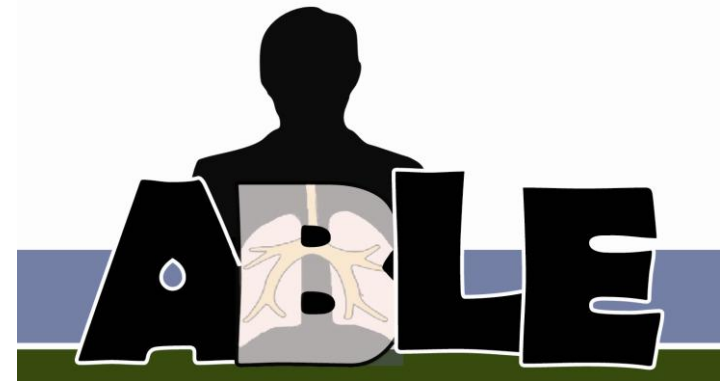
- Longitudinal cohort study
- New York City and Chicago
- Cohort: 452 elderly asthmatics
- In-person interview





Study Design

Inclusion Criteria:

- Mild, moderate, or severe persistent asthma
- Age ≥ 60 years
- English- or Spanish-speaking
- < 10 pack year history of cigarette smoking



Measures: Outcomes

Outcome	Measure	Description
Medication Adherence	Medication Adherence Report Scale	10-item, self report Adapted for asthma medication Score ≥ 4.5 = good adherence
Diskus Technique 	Demonstration	7 step checklist, observation >75% steps correct
Meter Dose Inhaler Technique 	Demonstration	8 step checklist, observation >75% steps correct

Measures: Independent Variables

Independent Variable	Measure	Description
Health Literacy	STOFHLA	Reading and Numeracy sections Score ≥ 67 adequate Score < 67 limited
Crystallized Ability	Animal Naming	Name as many animals of any kind in one minute
Fluid Ability <ul style="list-style-type: none">- Processing Speed- Executive Function- Long Term Memory- Working Memory- Global Function	Factor Score <ul style="list-style-type: none">- Pattern Comparison- Trails A & B- WMS II Story A- WMS Letter Number Sequencing- MMSE	Series of validated cognitive tests

Analysis Plan

- Pearson correlations cognitive and literacy scores
- Independent multivariable logistic regression models
- Stepwise multivariable logistic regression models
 - Step 1: Health Literacy
 - Step 2: Health Literacy and Crystallized Ability
 - Step 3: Health Literacy and Fluid Ability
- Covariates: age, sex, race/ethnicity, chronic conditions, years with asthma

Sample Characteristics

- n=443
- Mean Age – 68 years
- 84% female
- 40% Hispanic
- 30% NH – Black
- 36% limited literacy
- 79% daily controller medication use
- Mean years with asthma – 31 years



Correlations of Cognitive Measures with STOFHLA

Cognitive Ability	Test	Correlation Coefficient
Crystallized Ability	Animal Naming	0.52
Fluid Ability	Factor score	0.81
Processing Speed	Pattern Comparison	0.70
Executive Function	Trails A & B	0.75
Working Memory	Letter Number	0.70
Working Memory	WMS immediate	0.56
Long Term Memory	WMS delayed	0.57
Global Function	MMSE	0.77

Independent Associations

- Health Literacy independently associated with all outcomes
- Fluid Ability independently associated with all outcomes
- Crystallized Ability independently associated with diskus technique

Adherence to Asthma Controller

	HL OR	HL + CA OR	HL + FA OR
Adequate Literacy	2.53* (1.43 - 4.49)	2.35* (1.29 - 4.26)	1.50 (0.72 - 3.12)
Crystallized Ability		1.02 (0.97 - 1.07)	
Fluid Ability			1.63* (1.01 - 2.63)

* $p < 0.05$

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Correct Diskus Technique

	HL OR	HL + CA OR	HL + FA OR
Adequate Literacy	3.25* (1.72 - 6.13)	2.50* (1.29 - 4.86)	2.01 (0.85 - 4.73)
Crystallized Ability		1.09* (1.02 - 1.17)	
Fluid Ability			1.76 (0.99 - 3.13)

* $p < 0.05$

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Correct Inhaler Technique

	HL OR	HL + CA OR	HL + FA OR
Adequate Literacy	1.71* (1.06 - 2.75)	1.67* (1.01 - 2.74)	1.09 (0.59 - 2.02)
Crystallized Ability		1.00 (0.96 - 1.05)	
Fluid Ability			1.48 (1.00 - 2.21)

* $p < 0.05$

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Conclusion

- Fluid and crystallized abilities predictive of asthma self-management behaviors
- Fluid abilities explain relationship between STOFHLA and asthma self-care behaviors

Limitations

- ❑ Elderly asthmatics
- ❑ 2 large urban academic medical centers
- ❑ Cross-sectional analyses
- ❑ Self-reported medication adherence

Implications

- Cognitive function is important
- Incorporate cognitive strategies into patient communication interventions
- Goal: reduce cognitive demands of health tasks



Thank You!

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HeLP

Health Literacy & Learning Program



Non-Adherent to Asthma Controller

	Model 1	Model 2	Model 3	Model 4
Limited Literacy	2.41* (1.35 - 4.29)			
Global Cognitive Function		0.81* (0.74 - 0.90)		
Crystalized Ability			0.95* (0.91 - 1.00)	
Fluid Ability				0.64* (0.46 - 0.90)

* p<0.05

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Correct Diskus Technique

	Model 1	Model 2	Model 3	Model 4
Limited Literacy	3.25* (1.70 - 6.23)			
Global Cognitive Function		0.81* (0.74 - 0.89)		
Crystalized Verbal Ability			0.87* (0.81 - 0.93)	
Fluid Cognitive Ability				0.46* (0.30 - 0.70)

* p<0.05

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Incorrect Diskus Technique

	Model 5	Model 6	Model 7	Model 8
Limited Literacy	2.02 (0.94 - 4.33)	2.31* (1.16 - 4.59)	2.29* (1.01 - 5.20)	2.11 (0.88 - 5.07)
Global Cognitive Function	0.86* (0.77 - 0.96)			0.87* (0.76 - 0.99)
Crystalized Verbal Ability		0.89* (0.83 - 0.96)		0.89* (0.82 - 0.97)
Fluid Cognitive Ability			0.68 (0.39 - 1.19)	1.40 (0.67 - 2.95)

* $p < 0.05$

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Incorrect MDI Technique

	Model 1	Model 2	Model 3	Model 4
Limited Literacy	1.63* (1.01 - 2.63)			
Global Cognitive Function		0.88* (0.82 - 0.95)		
Crystallized Verbal Ability			0.97 (0.93 - 1.01)	
Fluid Cognitive Ability				0.67* (0.50 - 0.90)

* p<0.05

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Incorrect MDI Technique

	Model 5	Model 6	Model 7	Model 8
Limited Literacy	1.07 (0.61 - 1.86)	1.55 (0.93 - 2.57)	1.25 (0.68 - 2.29)	1.05 (0.56 - 1.96)
Global Cognitive Function	0.88* (0.81 - 0.96)			0.89* (0.80 - 0.98)
Crystallized Verbal Ability		0.99 (0.95 - 1.03)		1.01 (0.96 - 1.06)
Fluid Cognitive Ability			0.76 (0.51 - 1.12)	0.95 (0.59 - 1.53)

* $p < 0.05$

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Non-Adherent to Asthma Controller

	Model 1	Model 2	Model 3	Model 4
Health Literacy	2.41 [†] (1.35 - 4.29)			
Global Cognitive Function		0.81 [‡] (0.74 - 0.90)		
Crystalized Verbal Ability			0.95* (0.91 - 1.00)	
Fluid Cognitive Ability				0.64* (0.46 - 0.90)

[‡] p<0.001, [†] p<0.01, * p<0.05

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Non-Adherent to Asthma Controller Medicine

	Model 5	Model 6	Model 7	Model 8
Health Literacy	1.30 (0.67 - 2.53)	2.15* (1.17 - 3.94)	1.85 (0.90 - 3.81)	1.43 (0.67 - 3.02)
Global Cognitive Function	0.81‡ (0.72 - 0.91)			0.80† (0.70 - 0.91)
Crystallized Verbal Ability		0.97 (0.92 - 1.02)		0.99 (0.93 - 1.04)
Fluid Cognitive Ability			0.76 (0.48 - 1.20)	1.20 (0.69 - 2.09)

‡ p<0.001, † p<0.01, * p<0.05

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

Improper Diskus Technique

	Model 1	Model 2	Model 3	Model 4
Health Literacy	3.25 [‡] (1.70 - 6.23)			
Global Cognitive Function		0.81 [‡] (0.74 - 0.89)		
Crystallized Verbal Ability			0.87 [‡] (0.81 - 0.93)	
Fluid Cognitive Ability				0.46 [‡] (0.30 - 0.70)

[‡] p<0.001, [†] p<0.01, * p<0.05

All models adjusted for age, sex, race, years with asthma, and total number of chronic conditions.

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Global Cognitive Function	0.86 [†] (0.77 - 0.96)			0.87* (0.76 - 0.99)
Crystalized Verbal Ability		0.89 [†] (0.83 - 0.96)		0.89 [†] (0.82 - 0.97)
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