



---

# Refining and Standardizing Health Literacy Assessment (R01-HL081485): English and Spanish Item Banks

**Elizabeth A. Hahn**

Department of Preventive Medicine and Institute for Healthcare Studies,  
Feinberg School of Medicine, Northwestern University  
e-hahn@northwestern.edu



# Health Literacy Assessment

---

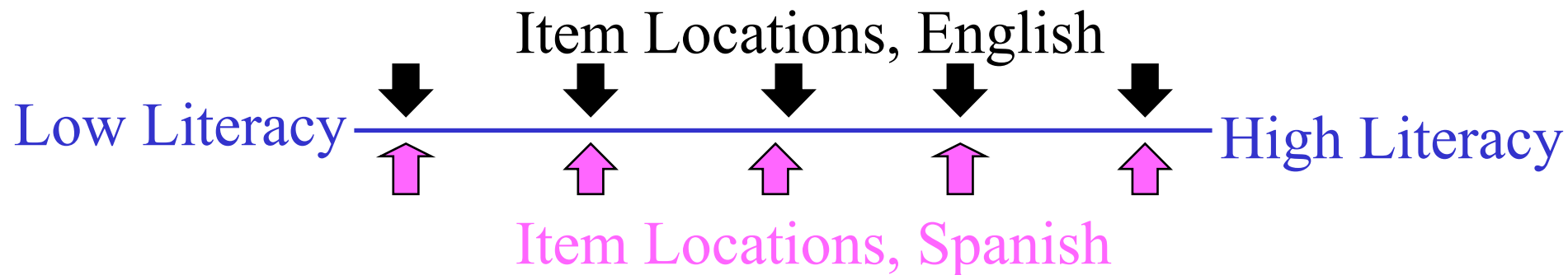
Aim 1: Develop English and Spanish language item banks for reading-related health literacy skills

Aim 2: Evaluate the feasibility, validity and acceptability of computer-based methods for assessment of health literacy

Aim 3: Develop computer-adaptive testing (CAT) of health literacy in clinical settings

Aim 4: Evaluate the associations between health literacy, sociodemographic/clinical characteristics and health outcomes in primary care patients

# Item Response Theory (IRT) Item Banks



- the bank of questions defines an underlying trait
- enables test instruments of various lengths and even computerized adaptive tests (CATs)
- the definition of the trait, and the meaning of each item, should be the same across all participant characteristics
  - otherwise, differences due to measurement bias could incorrectly be interpreted as real differences between groups



# Aims 1 & 2: Develop Item Banks and Multimedia Assessment Method

---

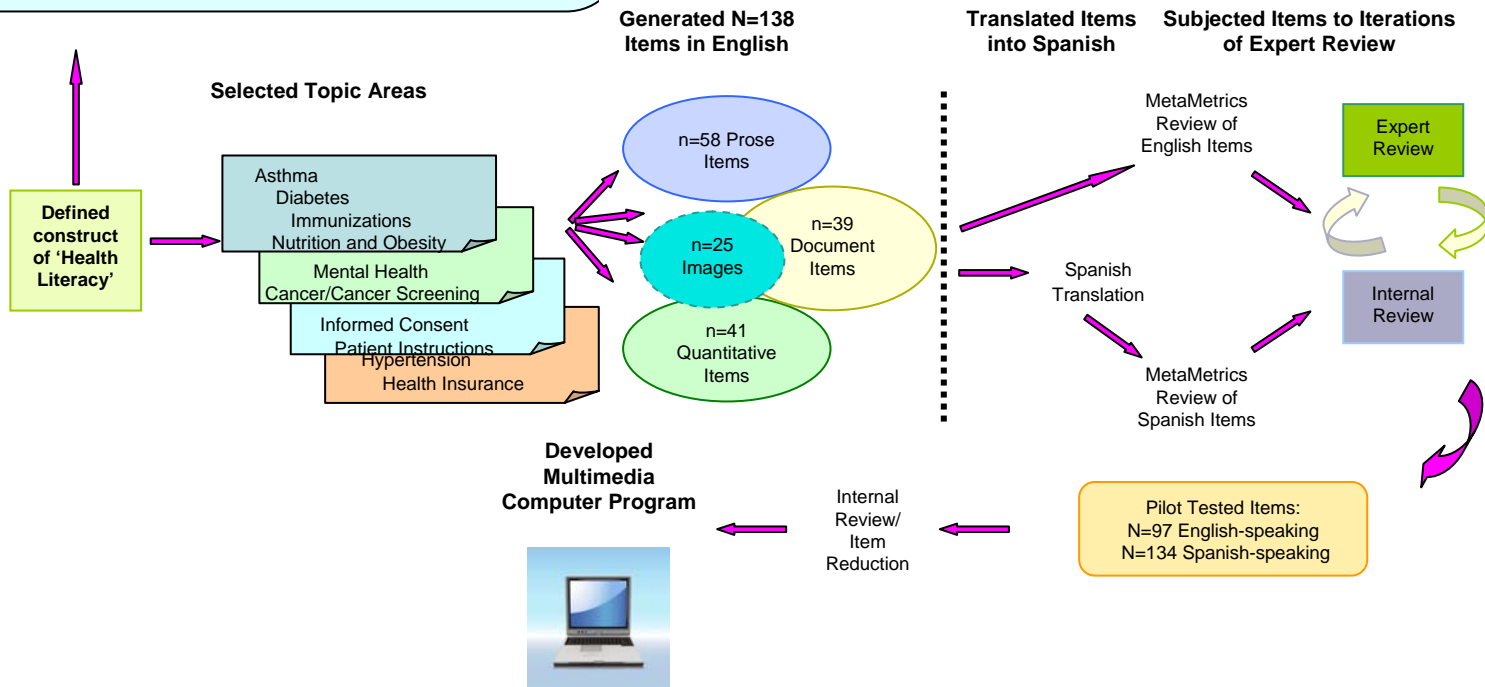
## Tasks:

- Write and test new health literacy items in English and Spanish
- Adapt “the Talking Touchscreen” / “la Pantalla Parlanchina”

(AHRQ R01 HS010333 / ACS TURSG-02-069-01-PBP; Hahn & Cella, Arch Phys Med Rehabil 84 (suppl 2):S35-S42, 2003; Hahn et al, J Oncol Manag 12(5): 9-12, 2003; Hahn et al, Psycho-Oncology 13: 86-95, 2004)

# Development Procedures

*“Health Literacy is the degree to which individuals have the capacity to read and comprehend health-related print material, identify and interpret information presented in graphical format (charts, graphs, tables), and perform arithmetic operations in order to make appropriate health and care decisions”*





# Item Examples

---

After a medical test or procedure, be sure to get the results. Ask whether you will get them in person or by phone or by mail. Also ask when you will get the results. Do not assume the results are fine if you do not get them when expected. If you do not get them, call your doctor.

You should \_\_\_\_\_ all test results.

mail

estimate

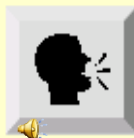
obtain

protect



## Medications for Mr. Beta

Medication	Start Date	End Date	Instructions
Hanebrex: 200 mg tablets	Aug. 27	Sept. 26	1 Tablet daily
Yostatin: 250 mg tablets	Mar. 8	None	1 Tablet twice daily
Nandozol: 90 mcg per puff	Mar. 8	None	1-2 Puffs by mouth every 4-6 hours as needed
Cellacillin: 250 mg tablets	Apr. 22	Apr. 29	2 Tablets on the first day, then 1 Tablet daily after that



Look at the Medications for Mr. Beta. How many tablets of Cellacillin should he take on the third day?

1

2

3

4



## Sample Body Mass Index Chart

		Weight in Pounds						
		145	155	165	175	185	195	
<b>Height in Inches</b>	<b>66</b>	23.4	25.0	26.6	28.2	29.9	31.5	<b>Underweight</b>
	<b>67</b>	22.7	24.3	25.8	27.4	29.0	30.5	
	<b>68</b>	22.0	23.6	25.1	26.6	28.1	29.6	
	<b>69</b>	21.4	22.9	24.4	25.8	27.3	28.8	
	<b>70</b>	20.8	22.2	23.7	25.1	26.5	28.0	
	<b>71</b>	20.2	21.6	23.0	24.4	25.8	27.2	
	<b>72</b>	19.7	21.0	22.4	23.7	25.1	26.4	
	<b>73</b>	19.1	20.4	21.8	23.1	24.4	25.7	
	<b>74</b>	18.6	19.9	21.2	22.5	23.8	25.0	
	<b>75</b>	18.1	19.4	20.6	21.9	23.1	24.4	
<b>76</b>	17.6	18.9	20.1	21.3	22.5	23.7		
								<b>Normal</b>
								<b>Overweight</b>
								<b>Obese</b>



Look at the Sample Body Mass Index Chart. In what category would a body mass index of 23.2 be?

Underweight

Normal

Overweight

Obese



# Characteristics of Pilot Testing Participants

	English-speaking ( <i>n</i> =97)	Spanish-speaking ( <i>n</i> =134)
% female	65%	75%
Mean age (SD)	44.0 (14.5)	38.7 (11.8)
Hispanic ethnicity	19%	99%
Race		
<i>Afr-Am</i>	60%	-----
<i>White</i>	7%	22%
<i>Other</i>	33%	78%
Education		
< <i>HS</i>	43%	53%
<i>HS / GED</i>	31%	25%
<i>College</i>	26%	22%
<i>not avail.</i>	( <i>n</i> =27)	-----
Method		
<i>Paper &amp; Pencil</i>	74%	100%
<i>Talking Touchscreen</i>	26%	-----



# Cognitive Interviews with 24 English- and 14 Spanish-speaking participants

---

- Nearly all (>90% English, 100% Spanish) correctly described the steps needed to answer each type of question:
  - *Instructions are clear; read the question and choose correct answer to complete the sentence.*
  - *Look at entire chart, look at question, then back at chart and choose answer.*
  - *I read the question and looked at choices below; I used math skills.*
- Participants were comfortable answering the questions; only 1 English- and 3 Spanish-speaking participants felt uncomfortable or anxious:
  - *I wasn't sure if I was answering correctly and I wanted to make sure I was.*
  - *I felt anxious when I didn't understand a word.*



# Computer Acceptability Interviews with 25 English-speaking participants

---

- Most reported that it was easy to use and commented favorably on the screen design and the availability of audio:
  - *I don't know much about computers, but it was easy.*
  - *The words were big so I didn't have to put glasses on. The screen was nice and bright.*
  - *Simple; having questions read to me made me feel more comfortable.*
  - *I like the idea of using a touchscreen. I like the headphones and it allowed me to concentrate better.*
- Participants commented favorably on the items, even when acknowledging that some of them were difficult to answer:
  - *They were difficult, but interesting.*
  - *The questions were easy and understandable, but the medical words were hard.*
  - *I learned something about health today.*

# Psychometric Results of Pilot Testing

	English	Spanish
Total # items tested	98	127
# items dropped (point-biserial < 0.20)	21	29
# items dropped (too easy or redundant)	3	9
Difficulty range (# items retained)	< 0.30 (2)	< 0.30 (4)
	0.30-0.39 (4)	0.30-0.39 (6)
	0.40-0.49 (9)	0.40-0.49 (8)
	0.50-0.59 (6)	0.50-0.59 (11)
	0.60-0.69 (22)	0.60-0.69 (11)
	0.70-0.79 (18)	0.70-0.79 (20)
	0.80-0.89 (9)	0.80-0.89 (16)
	≥ 0.90 (4)	≥ 0.90 (13)



# Current Status

---

- Testing a 10-item English short form in ongoing projects
- Calibration testing: 90 English items and 90 Spanish items are now being tested with 600 primary care patients each
- Analysis plans:
  - Examine unidimensionality, i.e., the extent to which items measure a single latent trait
  - Calibrate items on the health literacy continuum using the most parsimonious model that displays good fit (1-PL or 2-PL)
  - Evaluate the possibility of differential item functioning (DIF) across language, gender, age, education, healthcare experience
  - Convene expert advisory panel to create ability classifications
  - Develop algorithm for computer-adaptive testing (CAT)



# Conclusions

---

- New health literacy items have good content validity, covering a variety of topics that are relevant to primary care patients and their healthcare providers
- Talking Touchscreen/Pantalla Parlanchina is easy to use and acceptable for self-administration of a health literacy test



# Implications for Policy, Practice or Delivery

---

- A bilingual, computer-adaptive test of health literacy will enable clinicians and researchers to more precisely determine at what level low health literacy begins to adversely affect health and healthcare utilization.
- This tool will also provide better opportunities to determine the independent effects of limited English proficiency and limited health literacy.
- By using novel computer-based methods for health literacy assessment in clinical settings, this tool will also increase the access of underserved populations to new technologies, and contribute information about the experiences of diverse populations with new technologies.



# Research Team

---

## Northwestern/NorthShore

*PI:* Elizabeth Hahn

*Co-Is:* David Cella, Kimberly Webster, Kathleen Yost

*Psychometricians:* Rita Bode, Seung Choi, Richard Gershon

*Research Assistants:* Veronica Valenzuela, Yvette Garcia, Beatriz Menendez

*Programmer:* Irina Kontsevaia

## Northwestern

*Site PI:* David Baker

## Access Community Health Network

*Site PI:* Hugo Alvarez

## Stroger Cook County Hospital

*Site PI:* Elizabeth Jacobs