Is the cloze procedure appropriate for older persons?

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Background

Older persons and HL

People 65 years of age and older

Studies with some measures show age-related differences

TOFHLA

Baker et al (2000). J Geront B 55 S368-S374.

"Future studies should prospectively examine whether functional literacy declines with age and whether this is explained by declines in cognitive function." (abstract)

NAAL

White & Dillow (2005). National Center for Education Statistics.

Other studies do not show differences

REALM

Sudore et al (2006) J Gen Int Med 21, 806-812; Green et al (2011) Clin J Amer Soc Nephrology 6, 1354-1360; Shigaki et al (2012) Ann Behav Sci Med Education 18, 13.

Question: Why?



TOFHLA vs. REALM

Reading comprehension vs sight word recognition

Cognitive aging?

- Some cognitive abilities change with age
- Executive functions, working memory, novel problem solving
- Processing efficiency
- Health literacy measures are related to basic cognitive abilities

Ownby et al (2014) Patient Educ Counseling, 38,

Cloze response format



Response format may an important difference among measures.

Cloze performance related to working memory

Ackerman et al (2000) Learning and Individual Differences, 12, 128-133; Ackerman et al (2002) J Exper Psychology 131, 567-589

Working memory is related to reading comprehension in older individuals

Caplan et al (2011) Psychol Aging 26, 439-450; de Beni et al (2007) Aging, Neuropsych Cognition 14, 189-212

Previous study showed age-related differential item functioning (DIF) on the TOFHLA

Ownby & Waldrop-Valverde (2013) J Aging Research 654589

DIF



Differential item functioning exists when an item is more or less difficult for members of a group when that is not relevant to the ability being measured

- Men vs. women, blacks vs. whites, younger vs. older
- Example: Item asking for name of a beaver
 - Older Hispanics vs white

Probability of a correct answer vs. overall ability for each group

Area between two curves can be calculated as beta



Previous study



Age-related differential item functioning in the TOFHLA in persons with HIV infection

24 of 50 TOFHLA Reading Comprehension items showed significant age-related DIF

Ownby & Waldrop-Valverde (2013). J Aging Research, 654589.

FLIGHT/VIDAS



As part of validation of the new measure, participants completed the full TOFHLA and cognitive measures

We evaluated TOFHLA items for possible age-related DIF using nonparametric item response analyses in TESTGRAF

ltem	Difficulty	SD	Discrimination	Beta ^b
A1ª	0.99	0.09	0.60	0.03
A2	0.97	0.16	0.53	0.00
A3	0.89	0.31	0.34	0.01
A4	0.97	0.18	0.42	0.04
A5	0.98	0.13	0.35	0.03
A6	0.96	0.20	0.42	0.01
A7	0.97	0.18	0.54	0.01
A8	0.98	0.13	0.34	0.01
A9	0.94	0.24	0.26	0.01
A10	0.97	0.17	0.54	0.05
A11	0.98	0.13	0.42	0.02
A12	0.99	0.11	0.54	0.02
A13	0.96	0.20	0.41	0.03
A14	0.95	0.21	0.55	0.01
A15	0.97	0.17	0.38	0.01
A16	0.97	0.16	0.57	0.03
B17	0.98	0.14	0.57	0.01
B18	0.99	0.09	0.60	0.01
B19	0.83	0.37	0.27	0.03
B20	0.97	0.18	0.25	0.00
B21	0.93	0.26	0.65	0.01
B22	0.95	0.22	0.42	0.02
B23	0.96	0.19	0.47	0.05
B24	0.84	0.37	0.49	0.08
B25	0.92	0.27	0.52	0.04
B26	0.92	0.27	0.52	0.04
B27	0.97	0.16	0.55	0.01
B28	0.97	0.16	0.58	0.02
B29	0.92	0.27	0.53	0.02
B30	0.94	0.24	0.63	0.02
B31	0.89	0.31	0.32	0.08
B32	0.92	0.27	0.41	0.05
B33	0.97	0.18	0.50	0.03
B34	0.49	0.50	0.19	0.19
B35	0.97	0.17	0.65	0.03
B36	0.97	0.17	0.50	0.02
C37	0.97	0.18	0.67	0.02
C38	0.93	0.25	0.68	0.02
C39	0.83	0.38	0.47	0.10
C40	0.84	0.37	0.52	0.03
C41	0.81	0.39	0.56	0.07
C42	0.92	0.27	0.56	0.02
C43	0.88	0.32	0.63	0.03
C44	0.92	0.27	0.68	0.02
C45	0.55	0.50	0.37	0.09
C46	0.83	0.38	0.56	0.02
C47	0.46	0.50	0.32	0.18
C48	0.86	0.35	0.57	0.04
C49	0.82	0.38	0.54	0.03
(50	0.88	() 3()	0.36	() () / () / ()

TOFHLA DIF

Eleven of 50 (22%) items show age-related DIF (beta > 0.04)

Seven of these 11 (14%) also showed age-related DIF in the earlier study with younger persons with HIV infection.

Age differences



Tested age differences in TOFHLA reading scores with and without the items that showed age-related DIF, correcting for education

Original Total Reading: 46.5 vs. 43.8; F = 17.26, p < 0.001

Reduced: 39.6 vs. 39.0, F = 2.62, p = 0.11

The TOFHLA score, without items showing age-related DIF, was no longer different between groups.

Relation of working memory -



In FLIGHT/VIDAS, working memory was assessed as digit span backwards

In regression models, we evaluated the relation of working memory to performance on the TOFHLA after taking education, general verbal ability, and reading skills into account.

Model for younger



Models for Participants Younger than 65							
	В	Std. Error	t	p	R ²	Adj R ²	Significance of change
Intercept	-2.95	1.13	-2.61	0.01			
Verbal Ability	0.05	0.02	2.93	0.004			
Reading	0.06	0.02	3.69	< 0.001			
Education	0.02	0.05	2.55	0.01	0.44	0.42	
Intercept	-2.70	1.14	-2.37	0.02			
Verbal	0.04	0.02	2.71	0.001			
Reading	0.06	0.02	3.43	0.001			
Education	0.12	0.05	2.49	0.01			
Working Memory	0.06	0.05	1.36	0.18	0.44	0.43	0.18

Older than 65 years

0.19

0.08

2.41

Working

Memory



Models for Participants 65 Years of Age or Older								
	В	Std. Error	t	p	R ²	Adj R ²	Significance of change	
Intercept	0.14	1.28	0.11	0.91				
Verbal Ability	-0.01	0.02	-0.67	0.95				
Reading	0.06	0.02	3.21	0.002				
Education	0.22	0.08	2.68	0.009	0.55	0.52		
Intercept	0.30	1.23	0.24	0.81				
Verbal	-0.003	0.02	-0.16	0.87				
Reading	0.05	0.02	2.54	0.01				
Education	0.23	0.08	2.87	0.006				

0.02

0.59

0.56

0.02

Conclusions



At least a portion of age-related differences in health literacy may be attributable to age-related cognitive changes not directly related to health literacy

On the other hand, working memory and other age-related cognitive changes may be important in health-related tasks.

Working memory is probably an important aspect of performance on some health literacy measures; its relation other factors is not clear.

Results suggest that the cloze procedure may be inappropriate for measures that assess health literacy in older individuals.

Or at least, its relation to working memory should be taken into account

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