Measurement of cognition in Core HRS INS

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USC

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Topics

- Existing measures
- Limitations of existing measures
- Considerations around HCAP
- Survey mode
- Recommendations

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Existing measures

	HRS	MHAS	ELSA	SHARE	CRELES	KLoSA	JSTAR	TILDA	CHARLS	NICOLA	ELSI	LASI	SPS	MARS
Orientation														
Orientation to Time	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Orientation to Space					×	×	×	×	×	×		×	×	×
Memory														
Immediate and delayed word recall	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Recall planned action			×					×			×			
Figure recall		×						×						
Language/Fluency														
Object naming	×		×	×		×		×	×	×	×	×		×
Animal naming	×	×	×	×				×	×		×	×		
Writing or reading a sentence		×				×		×	×	×		×		
Repeat a phrase						×		×	×	×				
Close your eyes						×		×	×	×		×		
Country ruler	×		×					×	×		×			×
3-stage task					×	×		×	×	×		×	×	
Medicine label comprehension			×					×						
Executive functioning														
Clock drawing				×								×		
Serial 7's	×	×	×	×	×	×	×	×	×	×		×		×
Symbol cancellation		×	×											
Backwards counting	×	×	×	×				×				×		×
Backwards digit span					×								×	
Number series	×		×						×			×		
Numbers in everyday life	×		×	×			×					×		
Visuospatial														
Overlapping pentagons						×		×	×	×		×		
Overlapping circles					×								×	

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Existing measures

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Orientation														
Orientation to Time	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Orientation to Space					×	×	×	×	×	×		×	×	×

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Existing measures

	HRS	MHAS	ELSA	SHARE	CRELES	KLoSA	JSTAR	TILDA	CHARLS	NICOLA	ELSI	LASI	SPS	MARS
Memory														
Immediate and delayed word recall	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Recall planned action			×					×			×			
Figure recall		×						×						

Existing measures

	HRS	MHAS	ELSA	SHARE	CRELES	KLoSA	JSTAR	TILDA	CHARLS	NICOLA	ELSI	LASI	SPS	MARS
Language/Fluency														
Object naming	X		X	X		X		X	X	X	X	X		X
Animal naming	X	X	X	X				X	X		X	X		
Writing or reading a sentence		X				X		X	X	X		X		
Repeat a phrase						X		X	X	X				
Close your eyes						X		X	X	X		X		
Country ruler	X		X					X	X		X			X
3-stage task					X	X		X	X	X		X	X	
Medicine label comprehension			X					X						

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Existing measures

	HRS	MHAS	ELSA	SHARE	CRELES	KLoSA	JSTAR	TILDA	CHARLS	NICOLA	ELSI	LASI	SPS	MARS
Executive functioning														
Clock drawing				×								×		
Serial 7's	×	×	×	×	×	×	×	×	×	×		×		×
Symbol cancellation		×	×											
Backwards counting	×	×	×	×				×				×		×
Backwards digit span					×								×	
Number series	×		×						×			×		
Numbers in everyday life	×		×	×			×					×		

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Existing measures

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Visuospatial														
Overlapping pentagons						×		×	×	×		×		
Overlapping circles					×								×	

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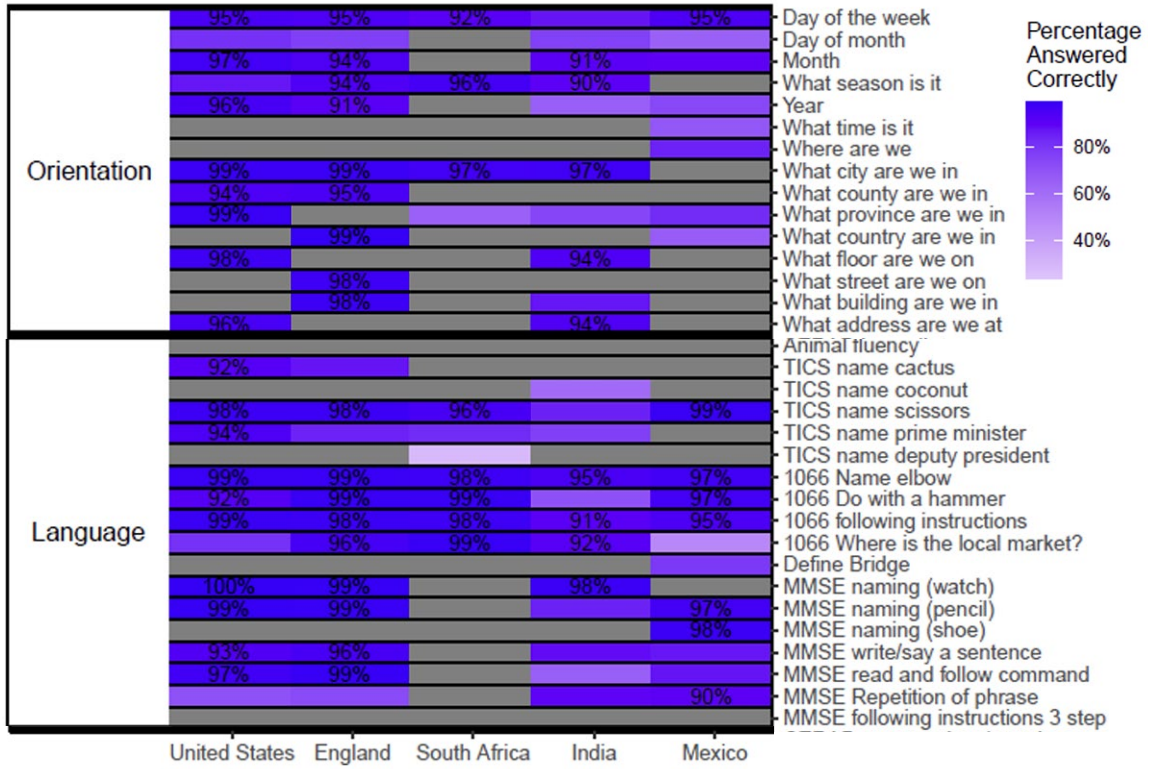
Challenge 1: information across the spectrum of cognitive impairment

A number of the included items are quite, easy – very few people get them incorrect in population-based samples.

- Typically come from batteries originally developed as cognitive screeners



Consequences for estimation of latent traits

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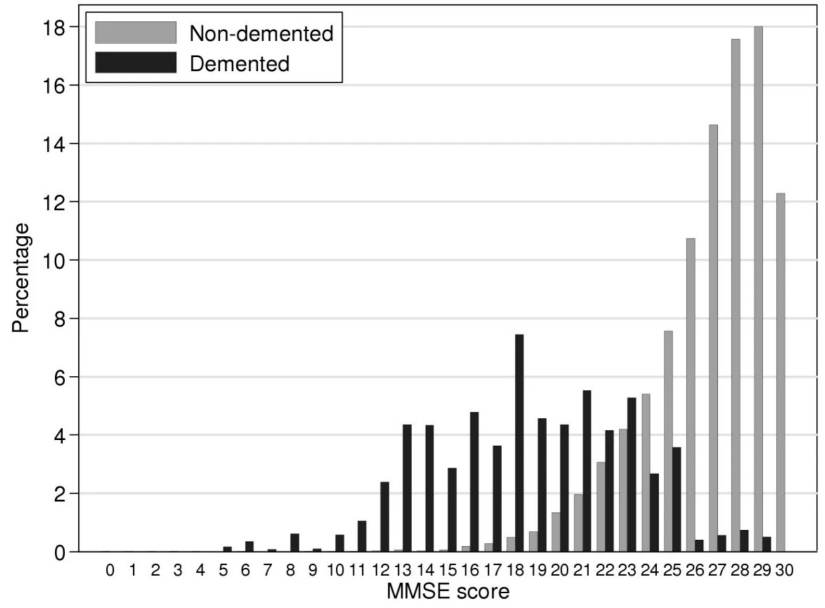
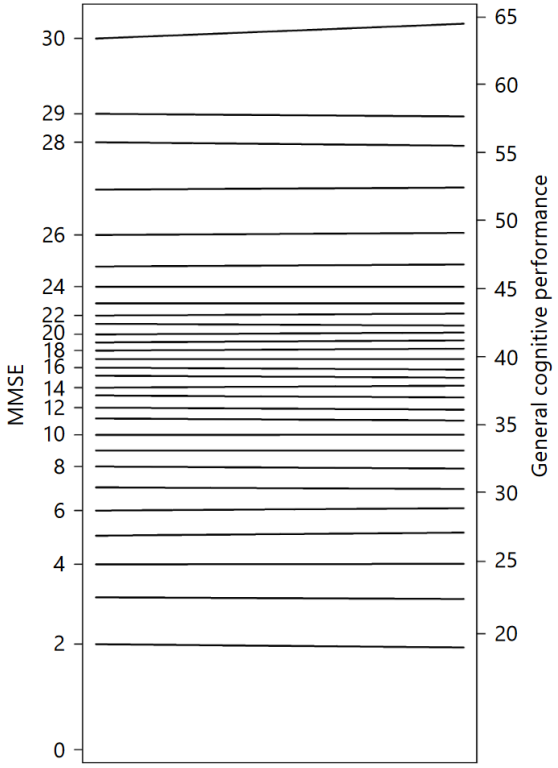
CFAS

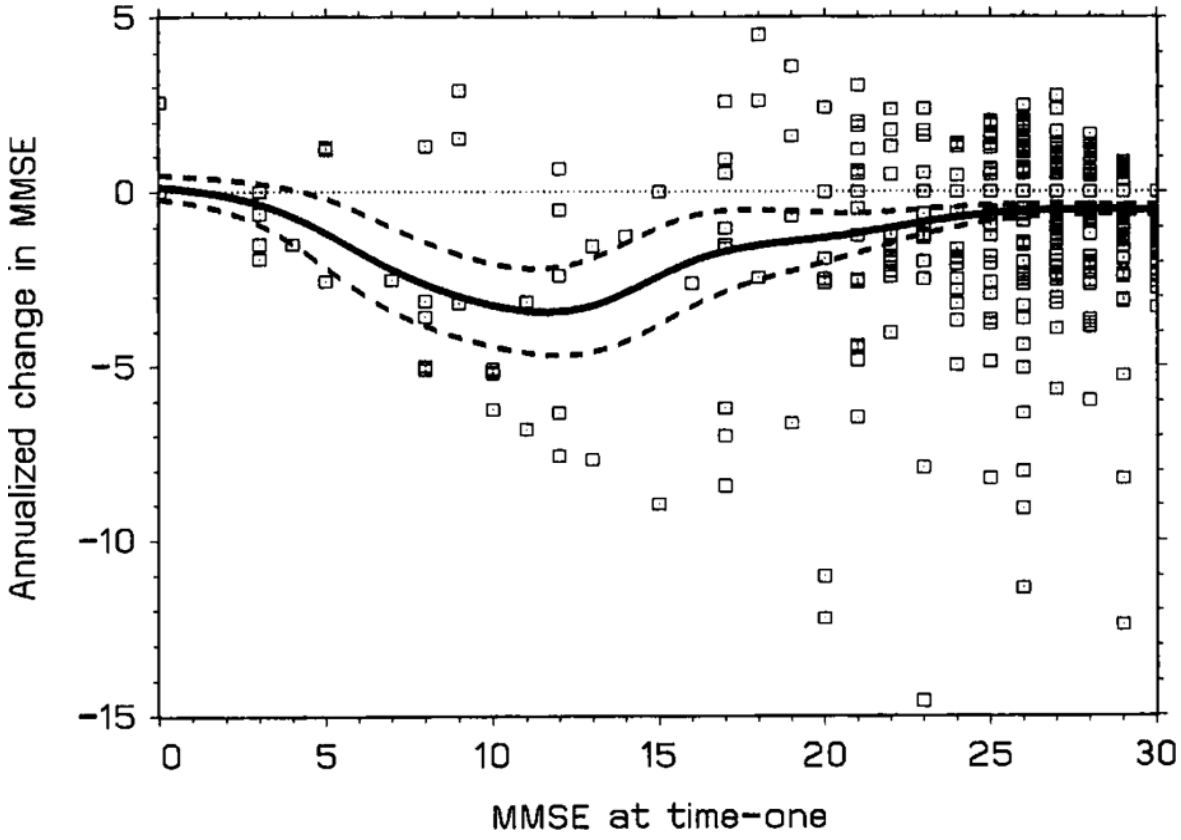


Crosswalk from ADAMS



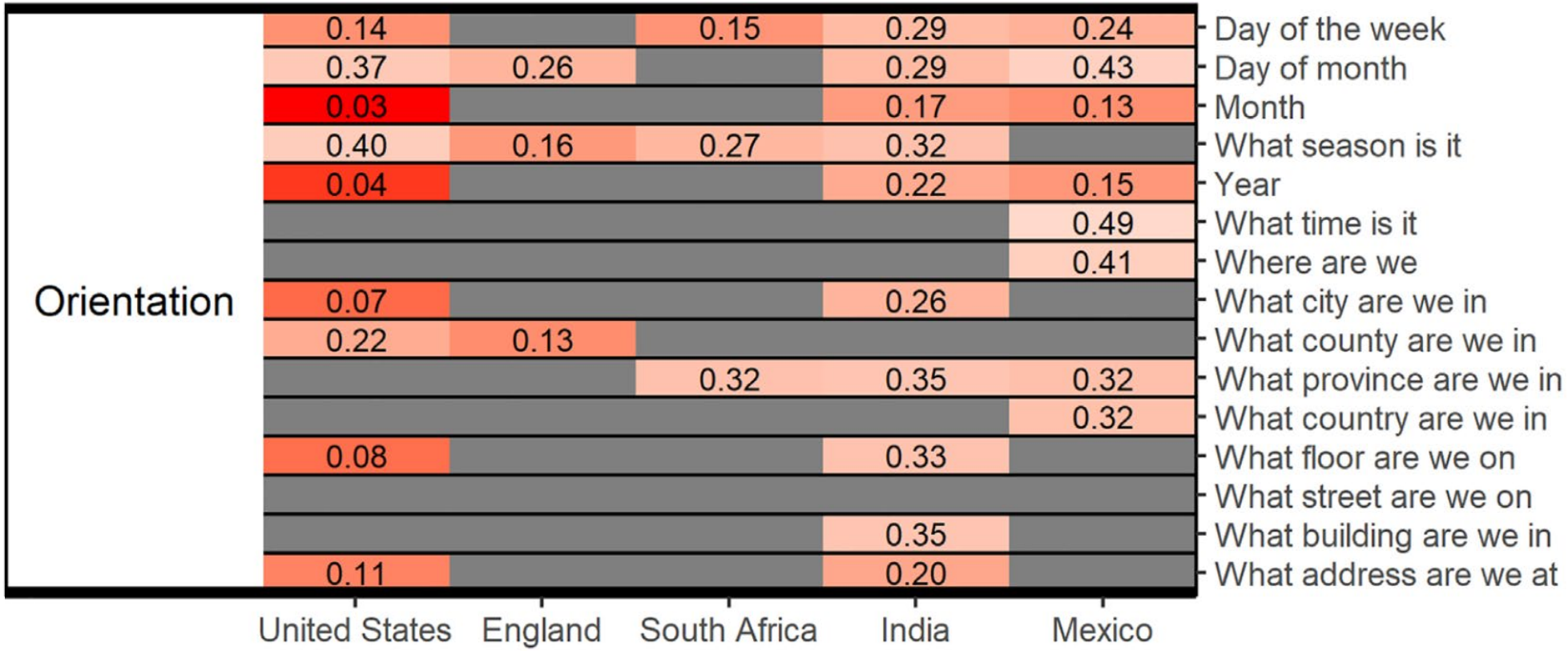
Huppert et al., 2005; Gross et al., 2014

This can create strange trajectories and other spurious effects



Butler et al., 1996

Challenge 2: appropriateness across settings (orientation)



Nichols et al., 2022

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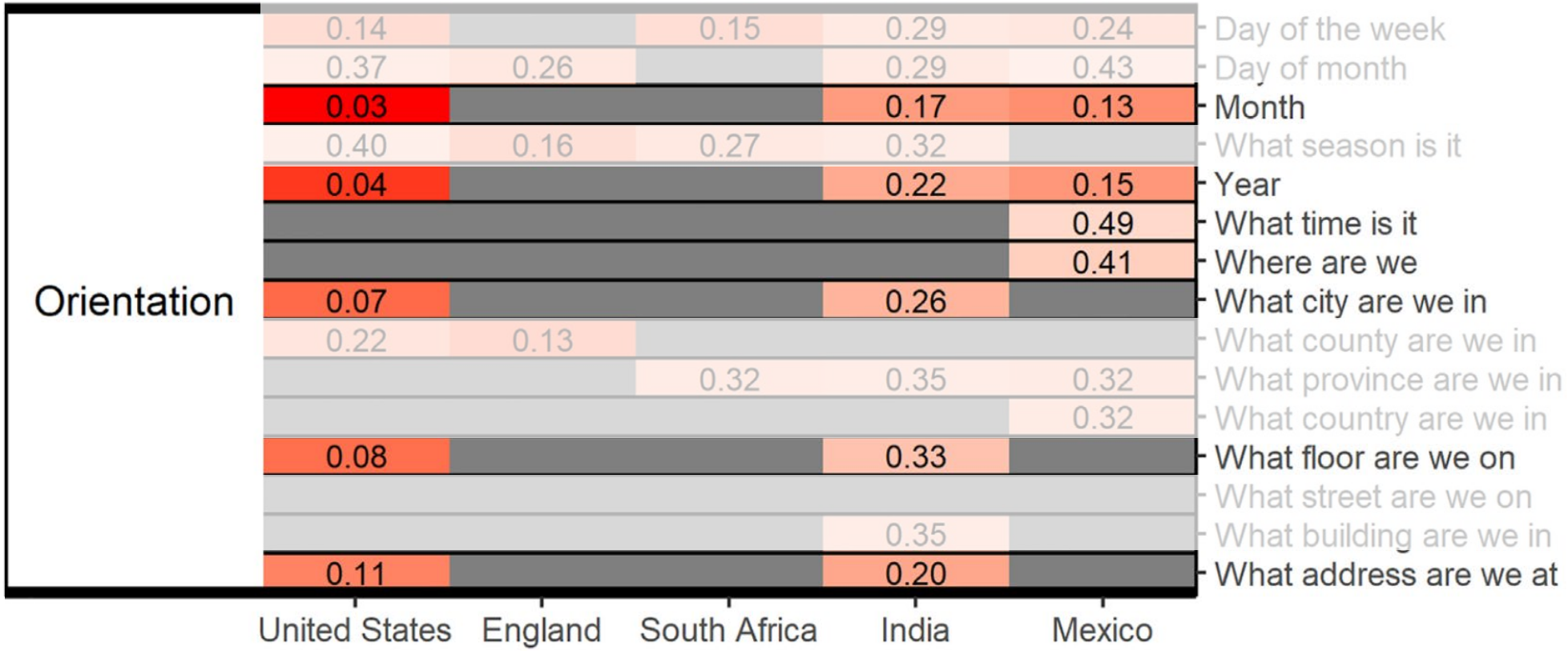

Nichols et al., 2022

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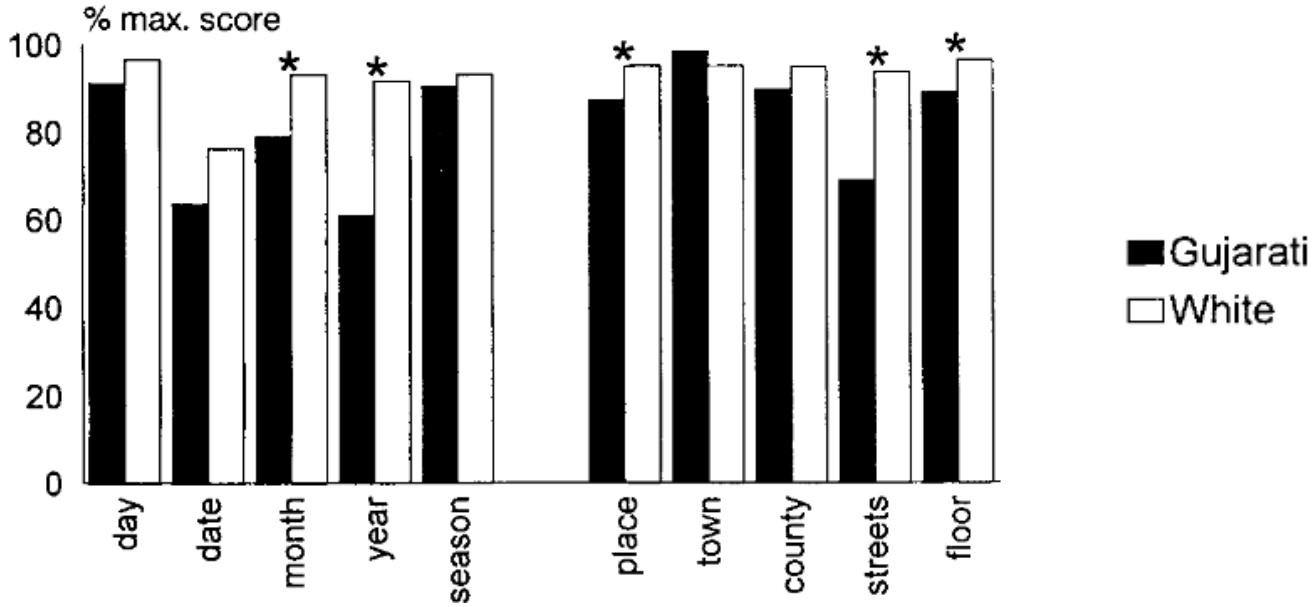
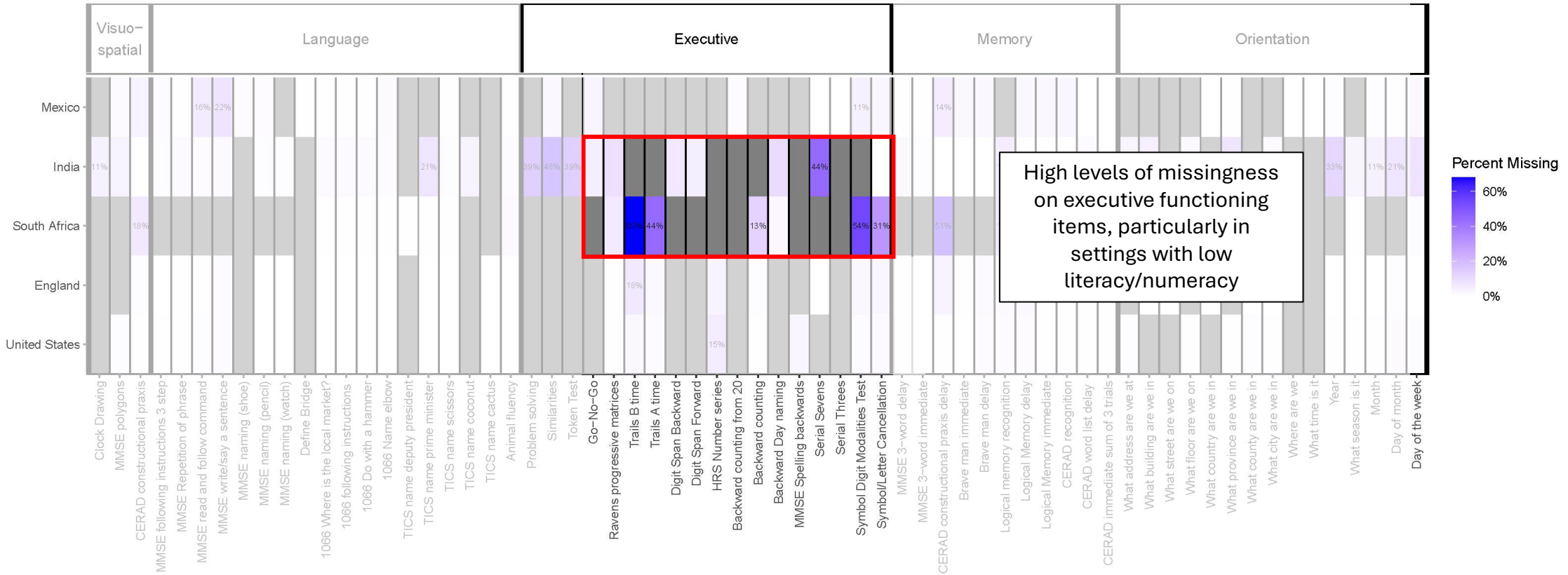


Lindesay et al., 1998

Challenge 2: appropriateness across settings (numeracy/literacy)



Nichols et al., 2022

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Challenge 2: appropriateness across settings (numeracy/literacy)

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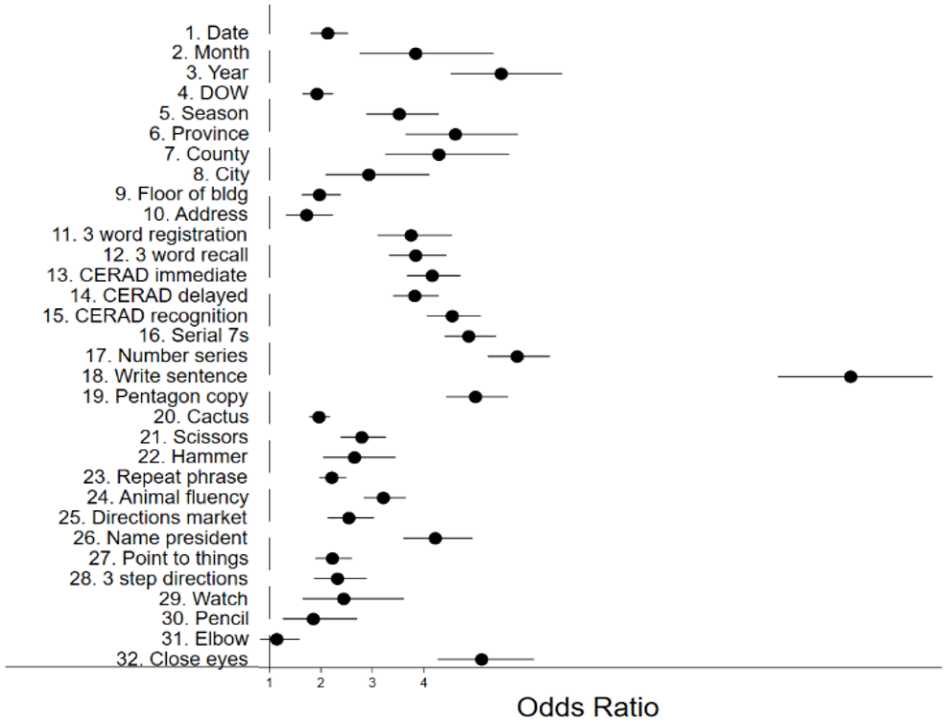
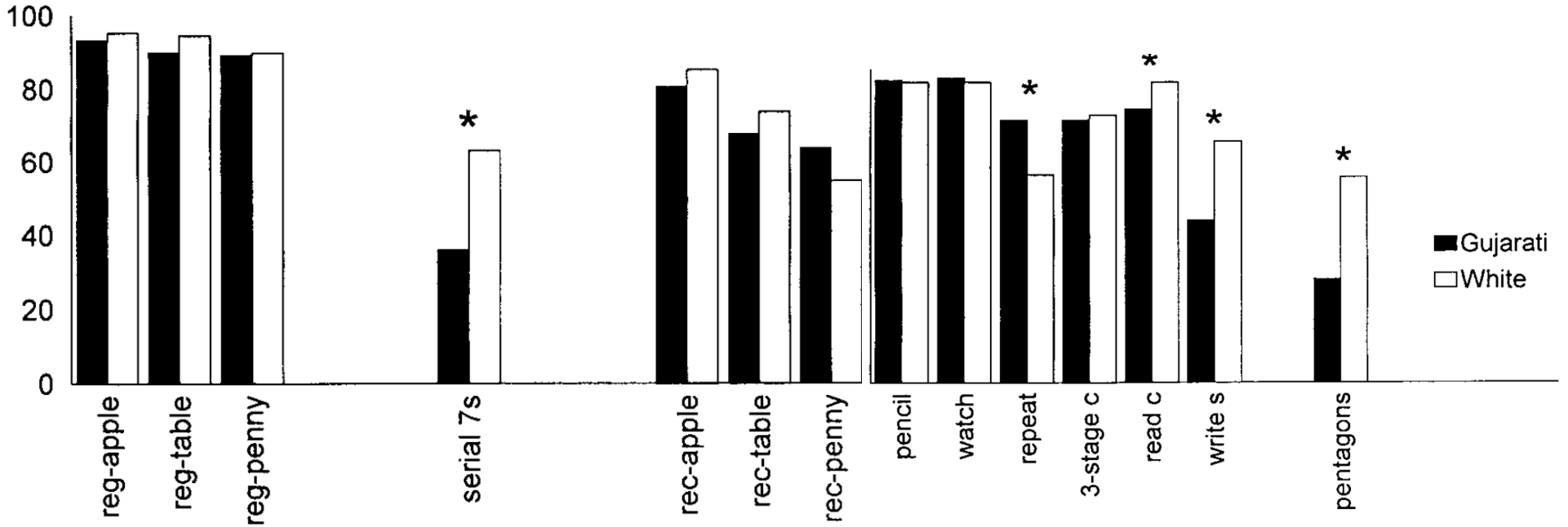
Odds of missing data: Illiterate compared to literate in CHARLS



Gross et al., *Under Review*

Challenge 2: appropriateness across settings (numeracy/literacy)



Lindesay et al., 1998

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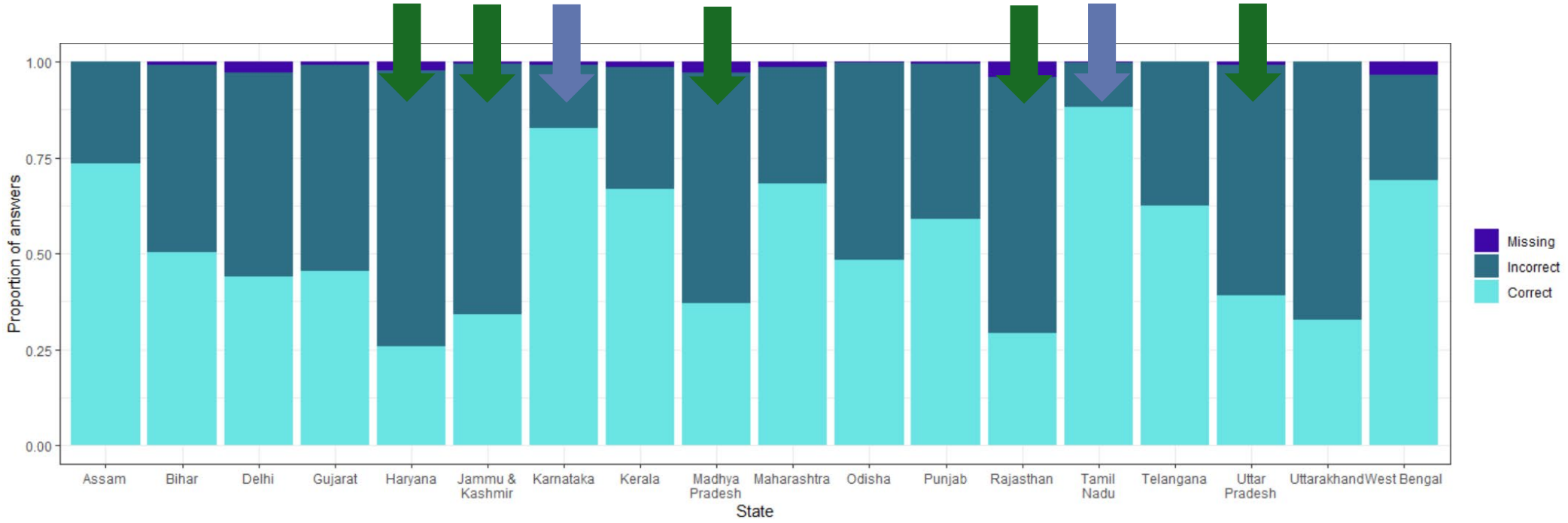
Challenge 2: appropriateness across settings (context)

Example: In LASI-DAD – the item for naming a cactus was changed to coconut, but this still posed problems in Wave 1.



Solution: in Wave 2, changed to naming a tree, more consistent throughout the country

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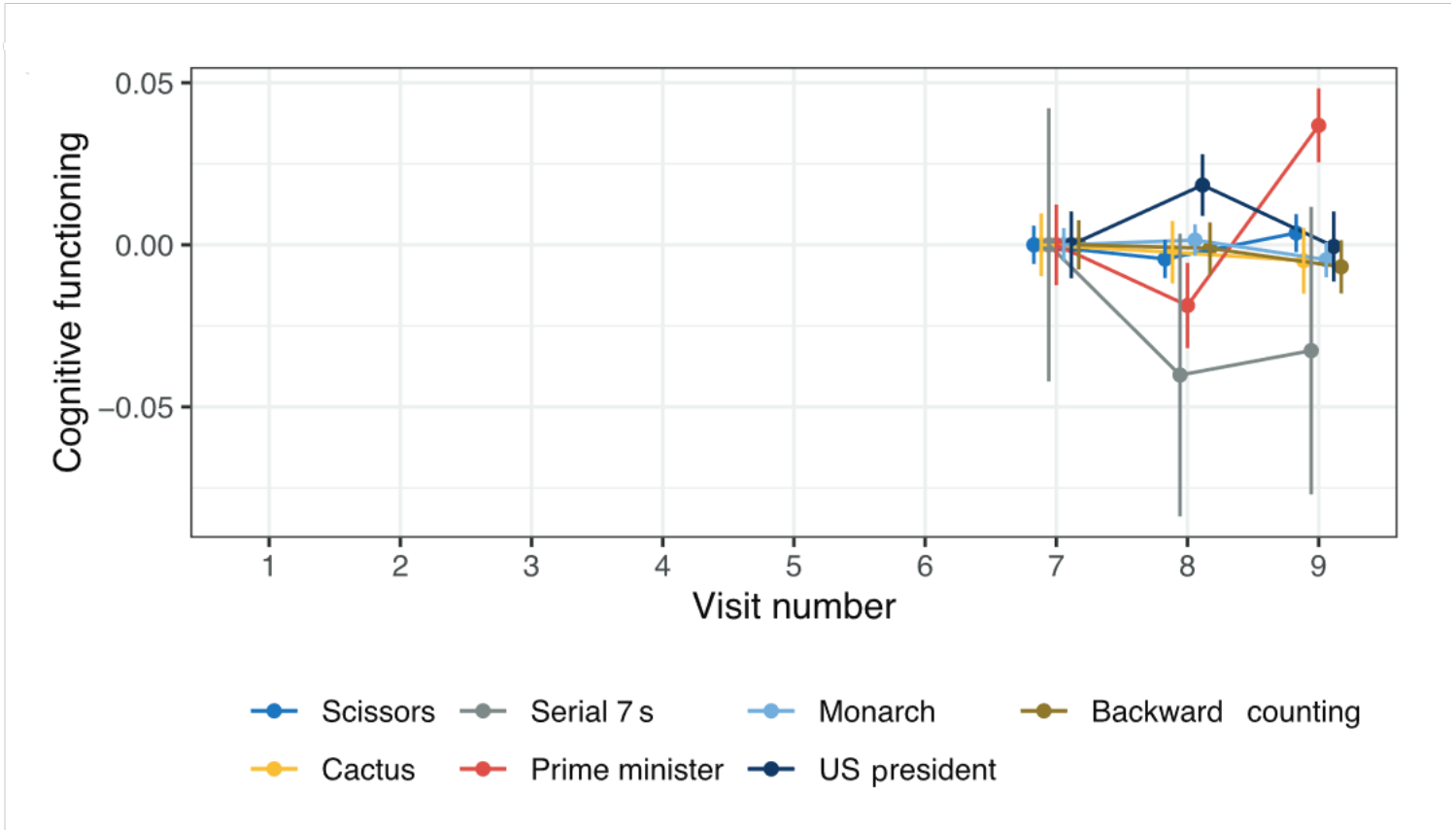
Challenge 3: items should be able to detect change over time



Nichols et al., 2024

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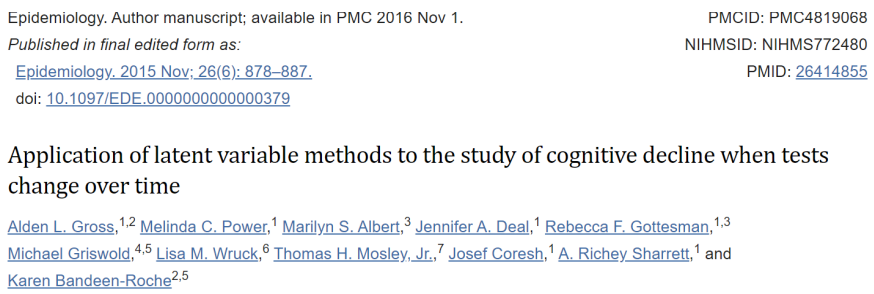
Challenge 4: estimation on a consistent metric when tests change over time

Cognitive tests change over waves as items are added or subtracted

- It would be great to be able to estimate a latent trait using all tests at all time points
- This is conceptually possible using CFA:



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doi: 10.1097/EDE.0000000000000379

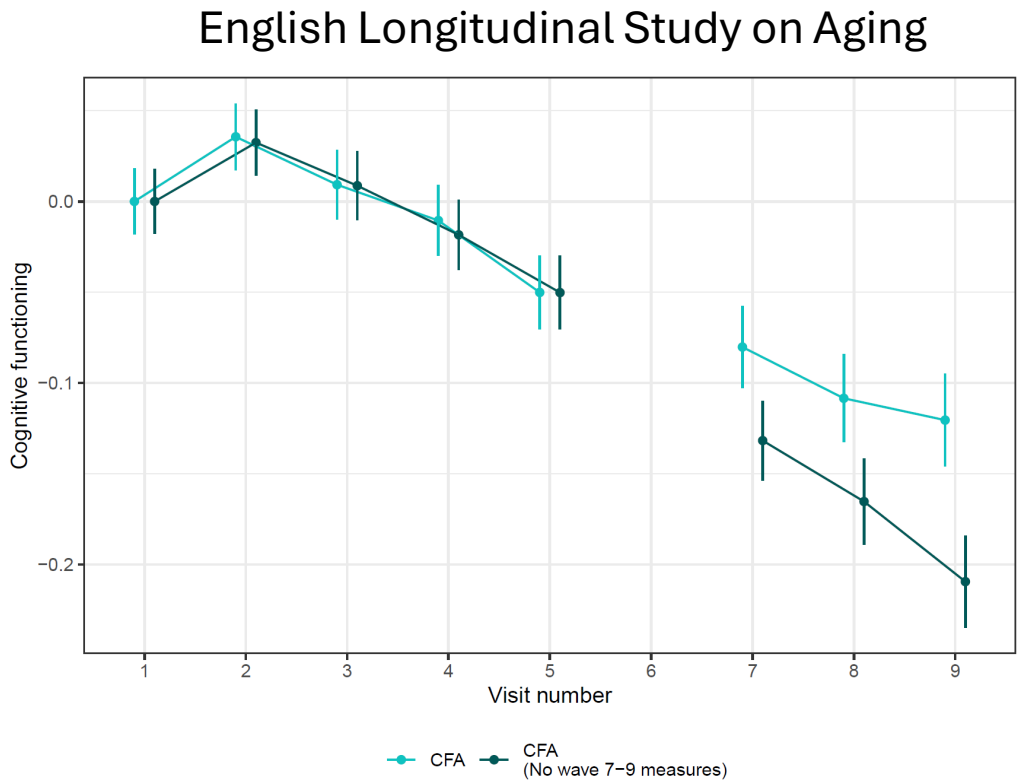
PMCID: PMC4819068
NIHMSID: NIHMS772480
PMID: 26414855

Application of latent variable methods to the study of cognitive decline when tests change over time

Alden L. Gross,[1,2] Melinda C. Power,[1] Marilyn S. Albert,[3] Jennifer A. Deal,[1] Rebecca F. Gottesman,[1,3] Michael Griswold,[4,5] Lisa M. Wruck,[6] Thomas H. Mosley, Jr.,[7] Josef Coresh,[1] A. Richey Sharrett,[1] and Karen Bandeen-Roche[2,5]

But, there are precision requirements

The precision of the battery can't change substantially when items are added/subtracted – this can lead to erroneous conclusions.



Nichols et al., 2024

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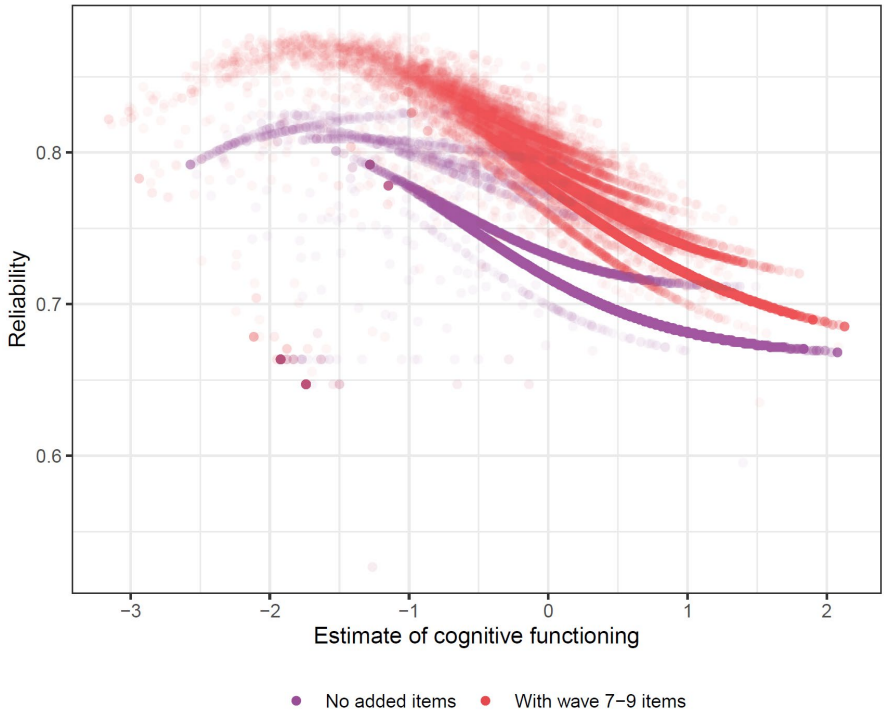

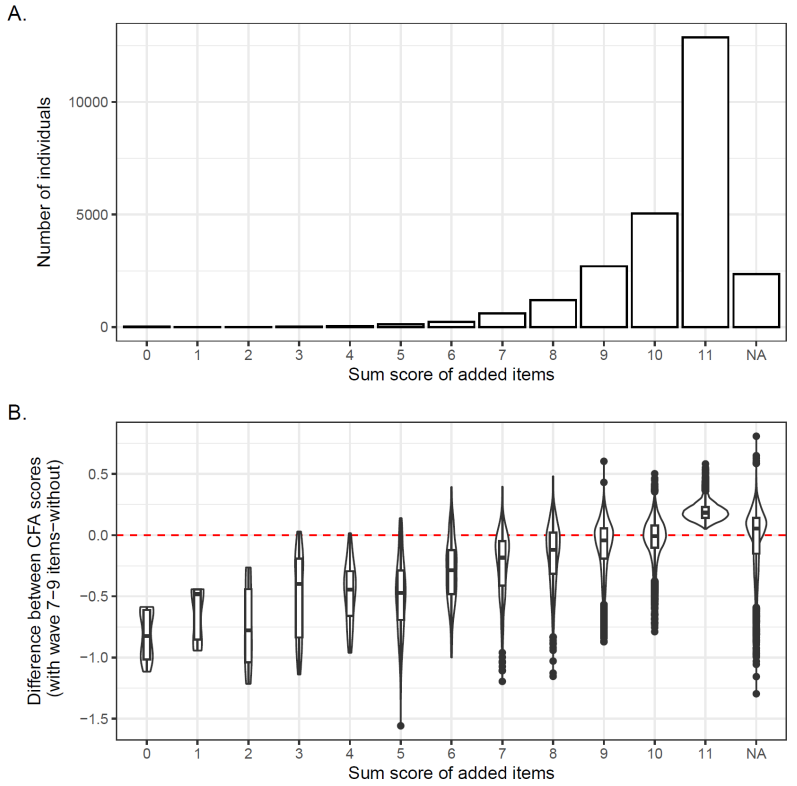

Nichols et al., 2024

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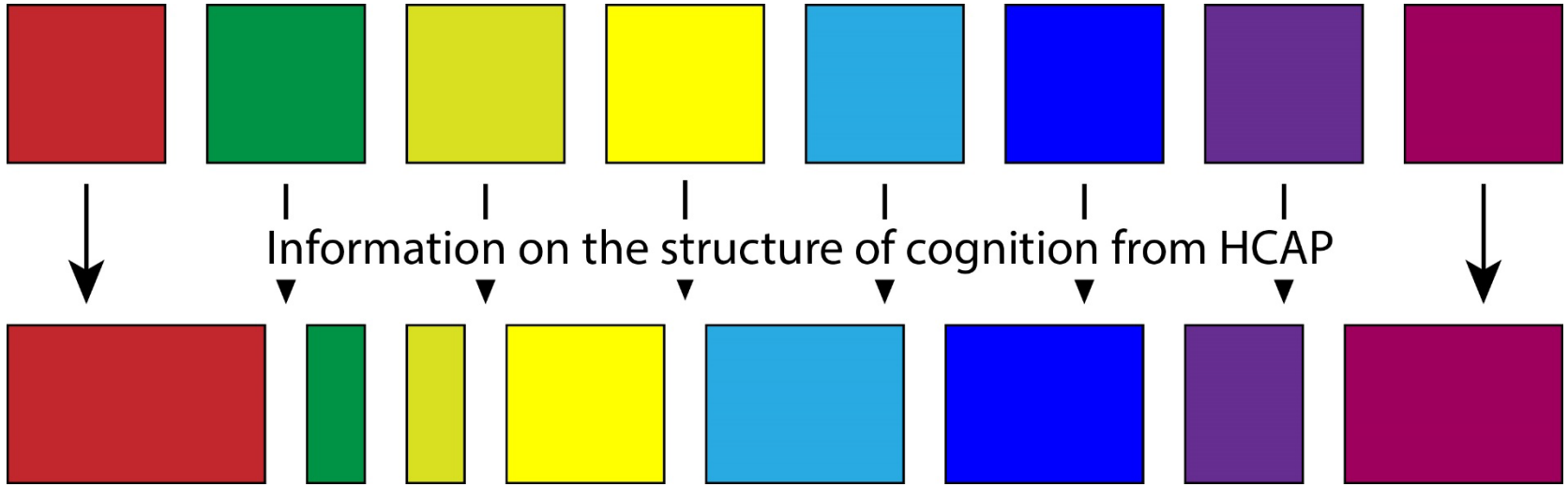
Challenges: can we leverage HCAP data to make improvements

Ultimately, we want to be able to use what we learned from HCAP to enhance the cognitive measures available in the core HRS INS studies.

- But we cannot create new items, we are limited by the data that have been collected.



Evidence from ELSA

Alzheimer's Association | Alzheimer's & Dementia®
THE JOURNAL OF THE ALZHEIMER'S ASSOCIATION

RESEARCH ARTICLE | Open Access

Development and assessment of analytic methods to improve the measurement of cognition in longitudinal studies of aging through the use of substudies with comprehensive neuropsychological testing

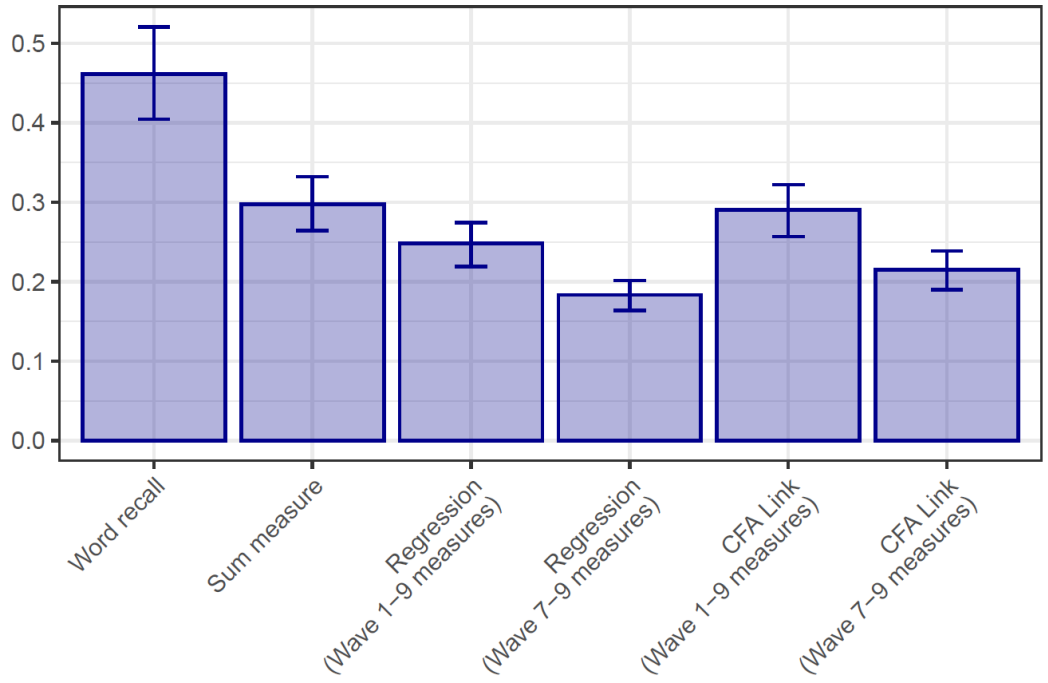
Emma Nichols, Richard N. Jones, Alden L. Gross, Shabina Hayat, Paola Zaninotto, Jinkook Lee

First published: 04 August 2024 | https://doi.org/10.1002/alz.14175

Assessment of six measures:

- Word recall
- Sum measure
- Regression predictions (2)
- CFA measures (2)

Mean squared error comparing measures derived from core items to gold standard factor scores using full HCAP data



Nichols et al., 2024

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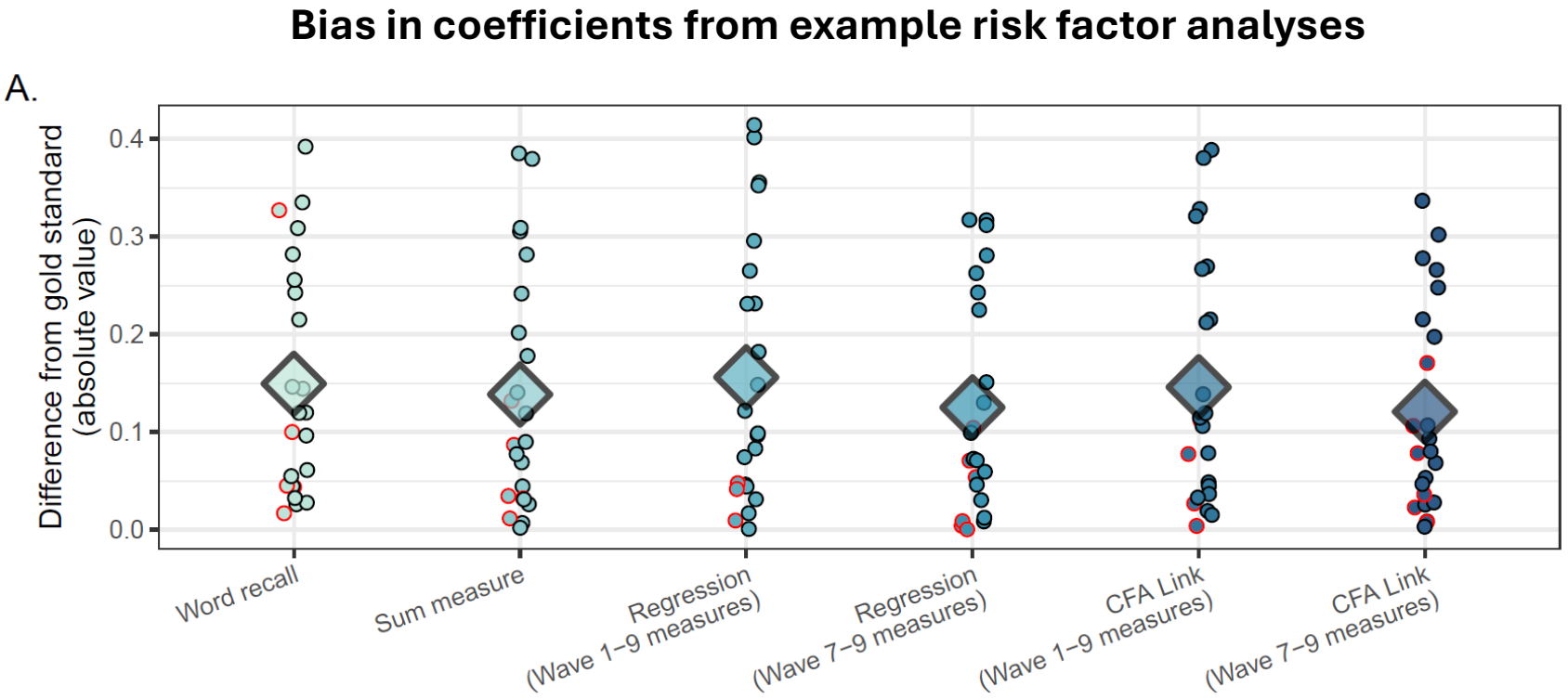
Evidence from ELSA



Nichols et al., 2024

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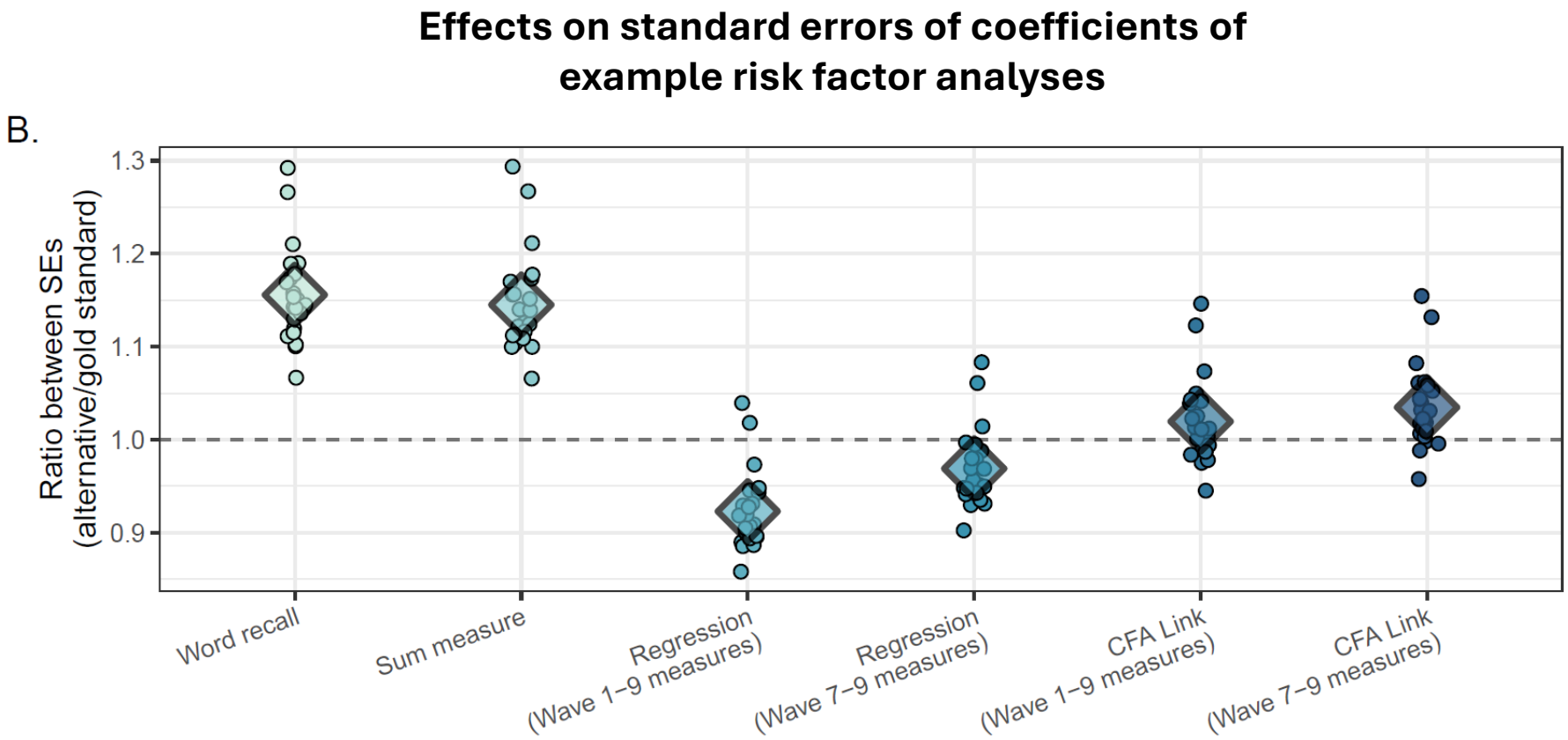

Nichols et al., 2024

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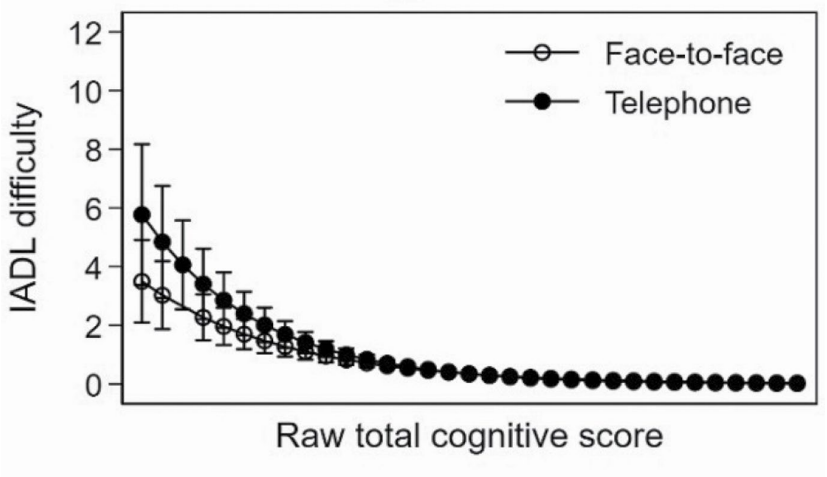
Mode effects

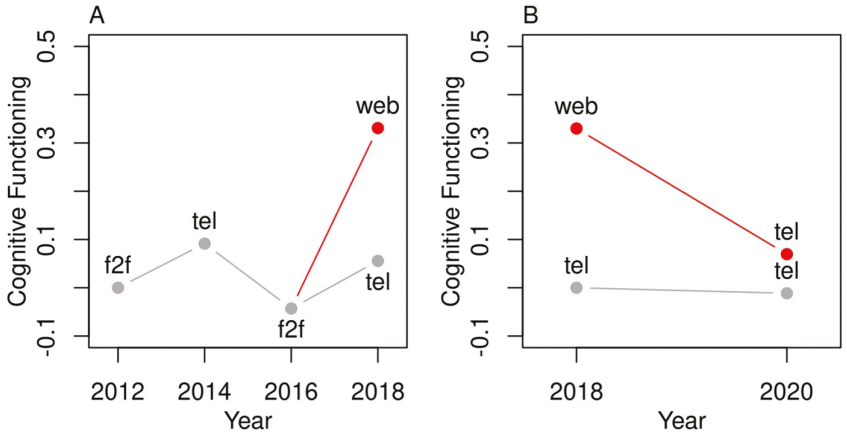
Changes or innovations to mode of data collection are likely inevitable, but care is needed to assess impacts on dementia measurement.

- Calibration samples or randomization

Face-to-face vs. telephone in HRS



Web vs. telephone in HRS



Smith et al., 2022; Domingue et al., 2023

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Mode effects

Also need to consider whether cognitive tests CAN be administered over the phone and/or web

- Phone administration limits ability to present any visual stimuli or do drawing tests
- May be possible via web administration, but could have different difficulty

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Decision making as a balancing act

Backwards compatibility for existing studies

Precision across the latent trait

Ability to classify dementia

Linkage to the HCAP studies

Achieving adequate precision to estimate models with items that change over time

Enabling comparisons across countries

Time and resource constraints

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Recommendations

Core

- Self-rated memory
- Write/say a sentence
- Immediate & delayed word recall
- Orientation to time
- Overlapping pentagons
- Three-stage task
- Symbol cancellation
- Animal naming
- Serial 7s/Backwards day naming

Extended

- Logical memory story recall
- Constructional praxis
- Go-no-go

Plus:
- Interviewer observations of factors that may have impaired performance
- IQCODE for informant reports

Thank you!

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The Gateway is a free public resource designed to facilitate cross-national and longitudinal studies on aging using the HRS international network of studies.

NIA/NIH 2R01 AG030153, also collaborate on 2R24AG048024, 1U24AG072699