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Background

- Generalization of prior learning enables individuals to apply previously acquired knowledge to novel contexts
- Emerging evidence suggests that generalization represents a **distinct cognitive construct**, separate from traditional domains such as episodic memory and executive function.
- Impairments in generalization may reflect **early cognitive changes in preclinical Alzheimer's disease (AD)**, potentially preceding detectable memory deficits.
- African Americans experience **over twice the risk of developing AD**, highlighting the importance of identifying sensitive markers in preclinical AD that are less affected by cultural and educational barriers.

Objective

To examine whether generalization of prior learning represents a distinct cognitive construct and evaluate its factor structure relative to established cognitive domains among older African American adults

Method

Participants were African American older adults enrolled in the Aging & Brain Health Alliance Pathways cohort.

Characteristic	Total Sample
N	832
Age, Mean (SD)	71.57 (6.56)
Education, Mean (SD)	14.21 (2.33)
MoCA, Mean (SD)	22.50 (3.46)
Female, n (%)	621 (74.6)

Cognitive Measures

Participants completed a neuropsychological battery assessing executive function, working memory, verbal fluency, episodic memory, and global cognition. Measures included Trail Making Test A and B, Digit Span Forward, Backward, and Sequential, Controlled Oral Word Association Test (COWA), Rey Auditory Verbal Learning Test (RAVLT), and the Montreal Cognitive Assessment (MoCA).

Generalization Measures

Generalization was assessed using the Rutgers Generalization Tasks. Variables entered into the factor analysis included training accuracy, training error, transfer accuracy, probe error, acquired equivalence acquisition, acquired equivalence retention, and acquired equivalence generalization.

Method (continued)

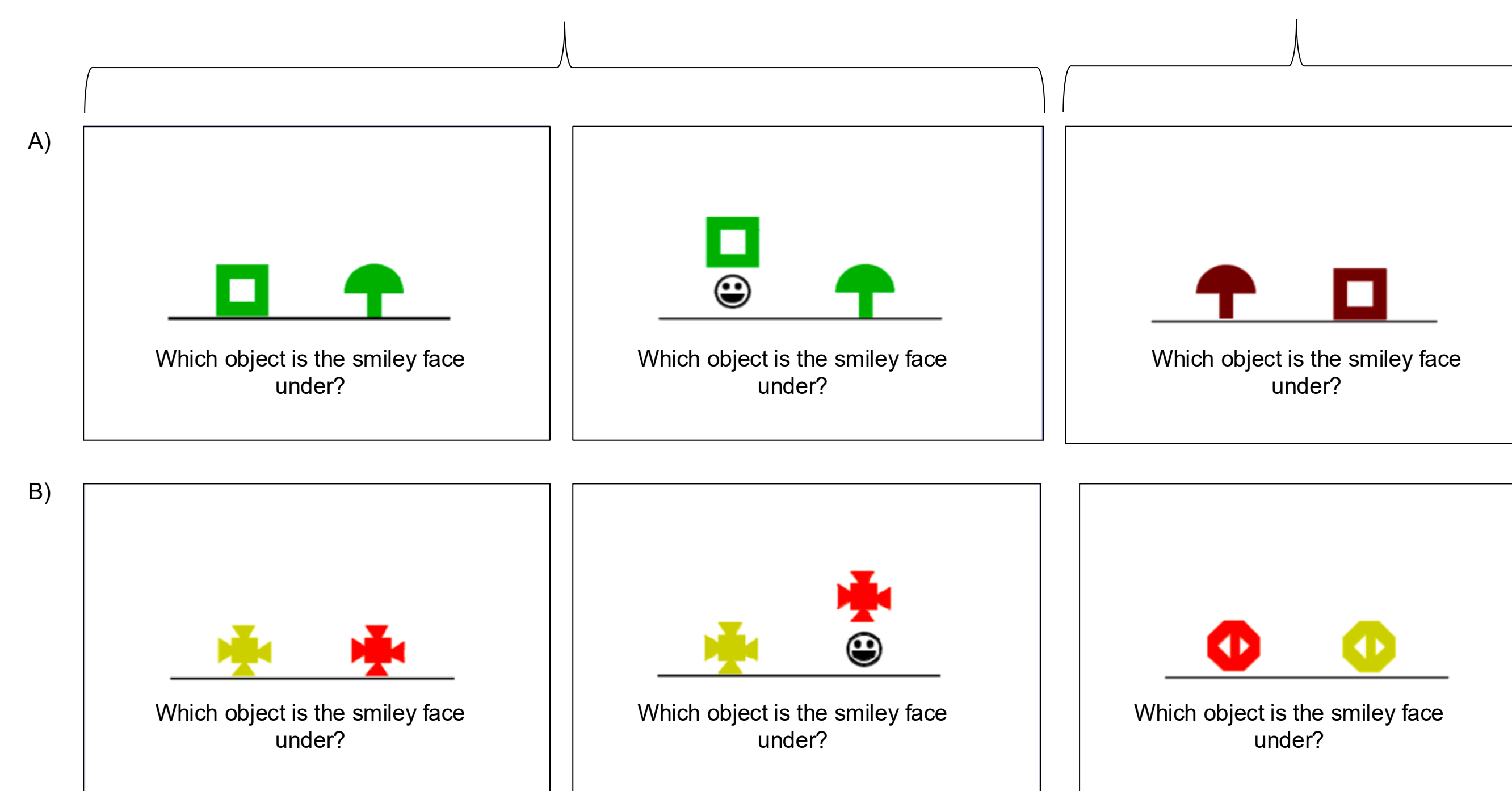
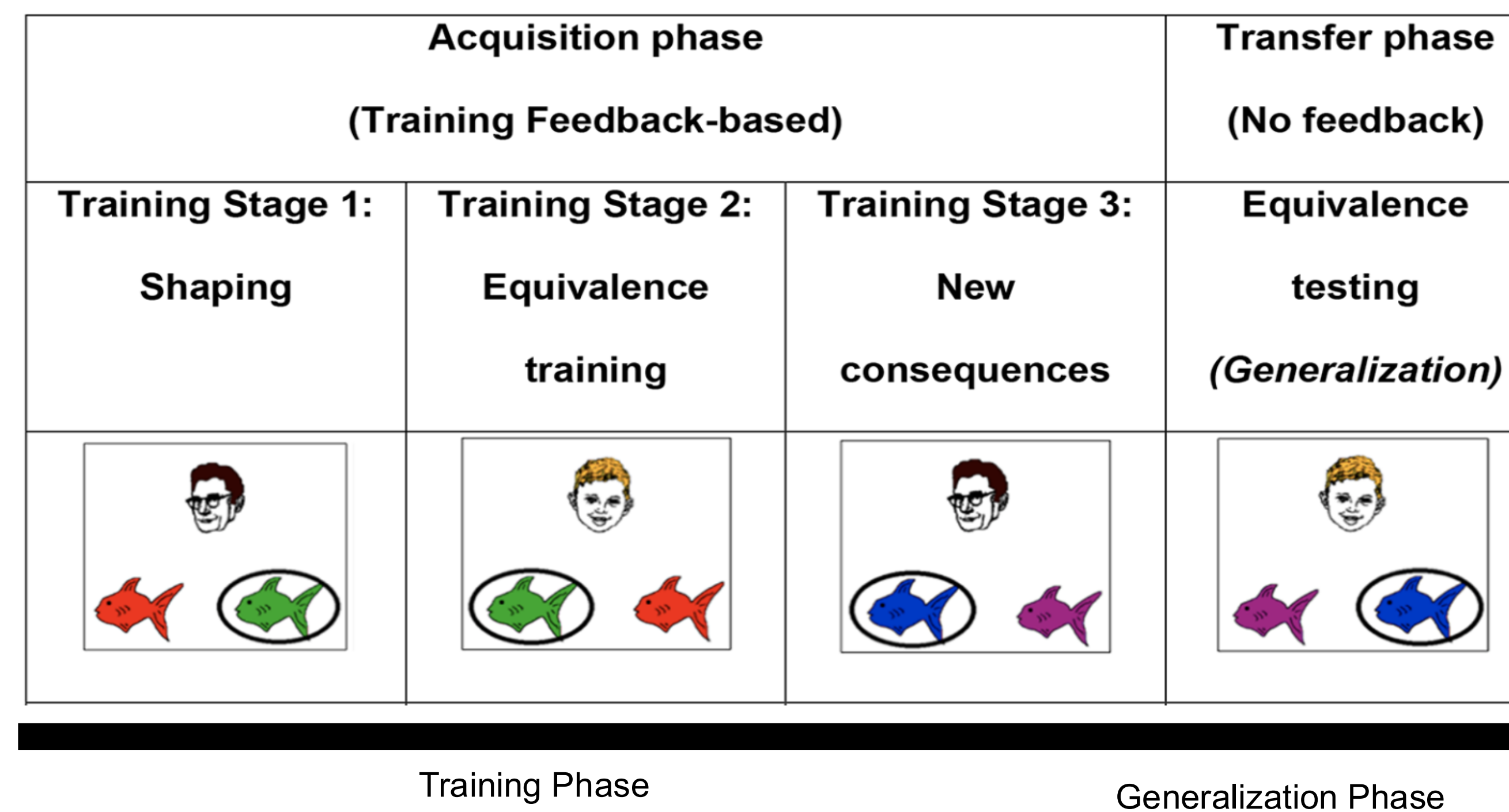


Figure 1. Rutgers Generalization Tasks: Acquired Equivalence Task and Stimulus Differentiation & Transfer Task.

Statistical Analysis:

Exploratory factor analysis (EFA) was conducted using maximum likelihood extraction in JASP. Sampling adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) statistic and Bartlett's test of sphericity ($\alpha = .05$). Loadings $\geq |0.40|$ were considered salient. An oblimin rotation was applied to permit correlations among latent cognitive factors. Factors were retained based on parallel analysis, scree plot inspection, interpretability, and theoretical relevance.

Results

1. EFA identified a five-factor solution explaining 58.1% of total variance.
2. Generalization measures loaded separately from traditional neuropsychological measures.
3. Parallel analysis and scree plot inspection supported retention of multiple interpretable factors.

Statistics	Value
Sample Size	832
KMO	0.821
Bartlett's x2	10,109.90
P-value	< .001
Variance Explained	58.1%

Results (continued)

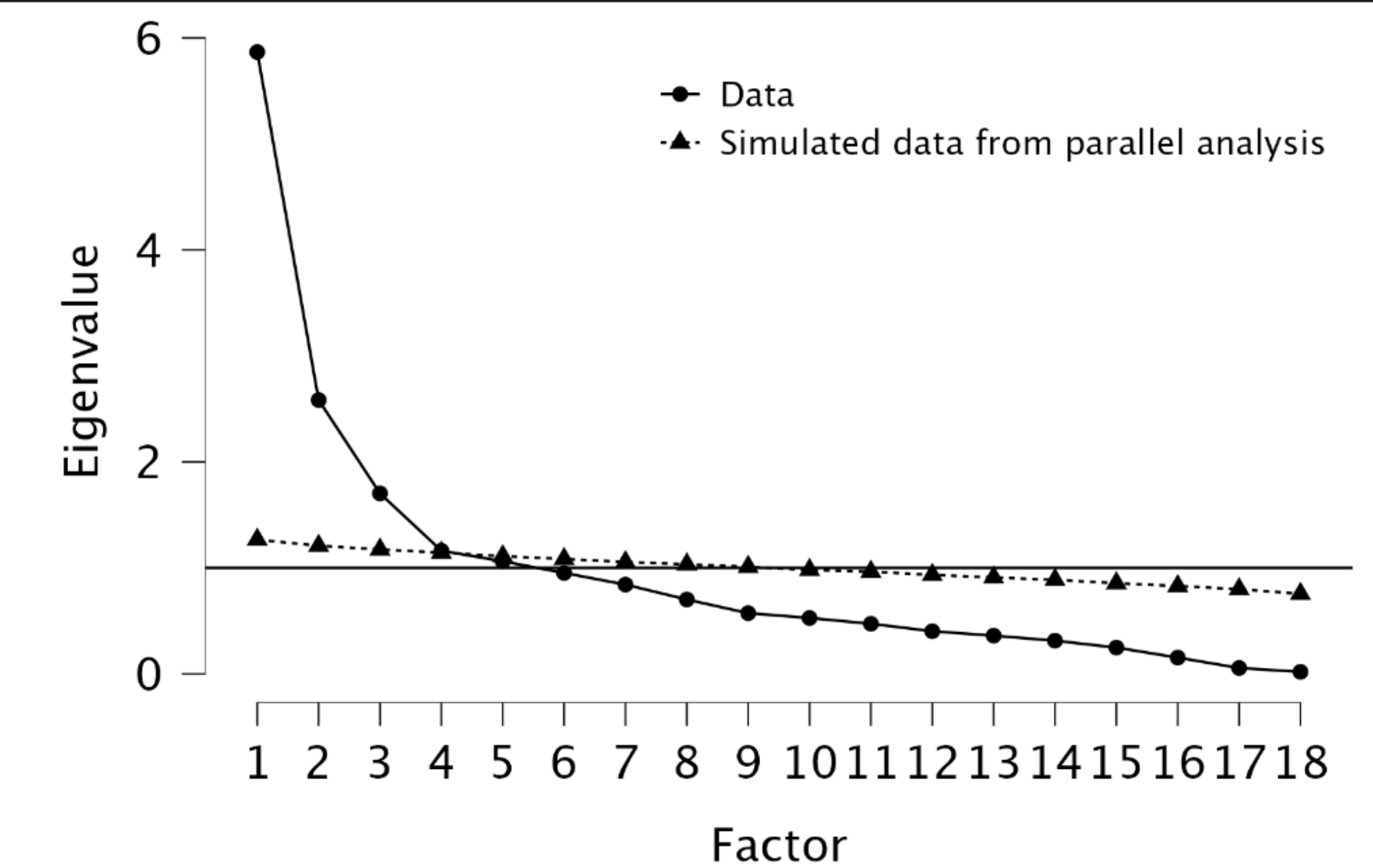


Figure 2. Scree plot representing the eigenvalues for each component

Measure	Stimulus Differentiation & Transfer	Executive Function & Working Memory	Verbal Learning & Recall	Acquired Equivalence Learning & Retention	Acquired Equivalence Generalization
Transfer Accuracy	0.92				
Probe Error	-0.91				
Training Error	-0.90				
Training Accuracy	0.87				
Trail Making Test B		-0.65			
COWA (FAS)		0.59			
Montreal Cognitive Assessment (MoCA)		0.58			
Digit Span Sequential		0.55			
RAVLT Delayed Recall			0.92		
RAVLT Learning			0.77		
Acquired Equivalence Retention				0.85	
Acquired Equivalence Acquisition				0.67	
Acquired Equivalence Generalization					0.37

Discussion

- Generalization of prior learning tasks can serve as specific cognitive markers distinct from other cognitive domains.
- Notably, while both the “Stimulus Differentiation and Transfer” and “Acquired Equivalence” factors are components of generalization of prior learning, they appear to represent separate constructs.
- A future direction includes exploring which aspect of generalization is most sensitive to earlier deficits in the preclinical AD phase.
- By recognizing the distinct nature of generalization, we enhance the potential for earlier interventions aimed at mitigating cognitive decline in this population.

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