Neuroanatomical Correlates of an Alternative Story Memory Test in Older Adults: The Left Trumps the Right

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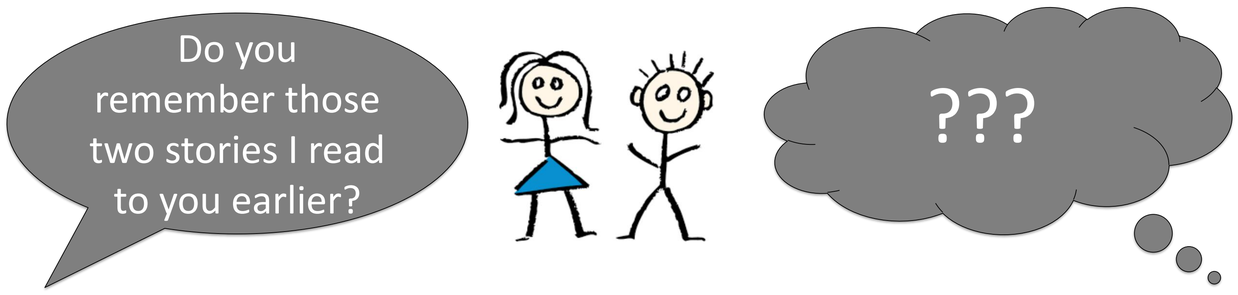
Background & Aims

- Story memory tests are commonly used to test verbal memory
- Often subject to practice effects with subsequent testing
- Need for alternative story sets



Aim 1 **To examine the relationship between 2 story sets: WMS-III Logical Memory & Newcomer Stories**

What are the Newcomer Stories? *A series of 8 brief stories developed by John Newcomer for use in memory research studies.*

Aim 2 **To determine neuroanatomic correlates of these 2 story sets (delayed recall). Are they similar or different?**

Regions of interest: *subregions of the L vs. R hippocampus*

Aim 3 **To learn whether thematic vs. verbatim scoring of the Newcomer stories (delayed recall) is better associated with:**

Entorhinal thickness, hippocampal, subiculum, and presubiculum volumes

Participants & Methods

UF Health Vitality Mind, College of Public Health and Health Professions | UF Neuropsychology and Structural NeuroImaging Laboratory, College of Public Health and Health Professions

Controls N = 52 → Healthy Older Adults N = 190 ← Controls N = 138

	Overall Sample N=190	Imaging Subsample N=134
Complete Story Data (N)	154	110
Age (yrs)	71.5 (7.5)	69.4 (6.4)
Education (yrs)	15.8 (2.6)	15.5 (2.7)
Sex (M/F)	63/91	50/60
Race (% Caucasion)	94.8	93.6

Memory Tasks administered as part of a larger battery:

1) WMS-II Logical Memory I & II (Total possible points: 50)
2) Newcomer Stories immediate (I) & delayed (II) recall
   - Verbatim (Total possible points: 88)
   - Thematic (Total possible points: 54)

	Overall (N =154)	Imaging Subsample (N=110)
LM I	28.5(6.9)	29.1(6.8)
LM II	28.4(7.9)	28.8(8.3)
NS I (T)	29.1(8.7)	29.0(9.1)
NS II (T)	24.2(9.2)	24.5(9.7)
NS I (V)	41.6(13.3)	42.5(13.6)
NS II (V)	33.7(13.2)	34.2(13.4)

MRI – Subsample had structural MRI; neuroanatomic regions were extracted using FreeSurfer automatic segmentation from T1-weighted images.

ROI: hippocampal volume, subiculum volume, presubiculum volume, entorhinal thickness; all corrected for total intracranial volume

Analyses

Series of hierarchical multiple regression analyses: Block 1 = demographic (age, education, and sex); **Block 2** = structural MRI variables (right & left); **DVs** = delayed recall of Logical Memory, delayed thematic recall of Newcomer stories, delayed verbatim recall of Newcomer Stories

Results

Aim 1 Results **Support for Validity (Relationship with LM) ✓**

- **Newcomer Stories (NS) significantly correlates with WMS-III Logical memory (LM)**

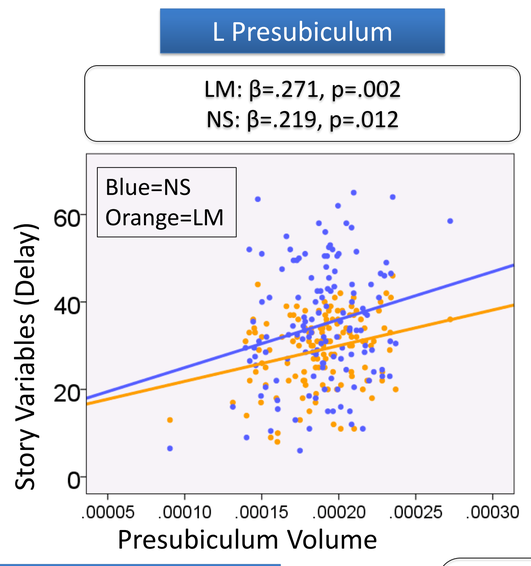
	LM I	LM II	NS I (T)	NS II (T)	NS I (V)	NS II (V)
LM I	-					
LM II	0.847	-				
NS I (T)	0.698	0.640	-			
NS II (T)	0.706	0.675	0.934	-		
NS I (V)	0.723	0.650	0.926	0.877	-	
NS II (V)	0.699	0.684	0.870	0.916	0.878	-

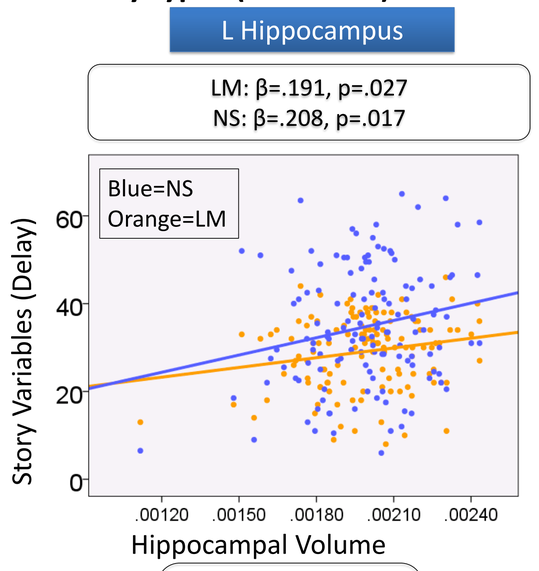
All sig. at p<.001

Aim 2 Results **Neuroimaging Correlates (External Validity) ✓**

Delayed recall of NS and LM were independently associated with:

- **Left, but not right, total hippocampal volume & presubiculum volume**
- **Only left presubiculum volume when controlling for demographics**
- **No significant difference in associations between story types (NS vs. LM)**





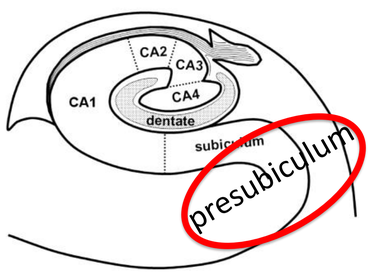
Controlling for Demographics → **L Presubiculum** LM: β=.224, p=.01 NS: β=.175, p=.05 → **L Hippocampus:** LM: β=.135, p=.149 NS: β=.163, p=.085

Aim 3 Results **Thematic vs. Verbatim Scoring – Neuroimaging ✗**

- **No difference between magnitude of association of verbatim compared to thematic scoring**

	r	Fisher's Z	p
	L Presubiculum		
NS II (V)	0.219	0.61	0.27
NS II (T)	0.205		
	L Hippocampus		
NS II (V)	0.208	0.42	0.34
NS II (T)	0.155		

Conclusions



What's with the presubiculum?

- Presubiculum is primary cortical input to entorhinal-hippocampal complex
- May be a sensitive early marker of AD; found to be related to memory scores in MCI and AD samples (Carlesimo et al., 2015)

Is this that story about the woman from South Boston?

Bottom Line:

- NS are a reasonable equivalent alternative to LM in a sample of mostly Caucasian and highly educated older adults
- NS scores are associated with presubiculum volume above and beyond differences associated with age, education, and gender
- LM and NS do not show significant differential relationships with neuroimaging variables (i.e., both are equally associated with L presubiculum and L hippocampus)
- No differences between NS scoring types in terms of associations with neuroanatomical memory regions

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