

Impact of Literacy, Cognition, Biomarkers, and Brain Structure within the Uganda Aging Cohort Study

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INTRODUCTION		METHODS		RESULTS						CONCLUSIONS			
- As of 2017, an estimated 27% of Ugandans over 10 years were non-literate.¹ - Literacy contributes to cognitive reserve and may be a more nuanced indicator than years of formal education.^{2,3} - We examined associations between literacy and cognition, plasma biomarkers, and brain structure in older adults in Uganda.		Neuropsychological Test	Cognitive Domain	Table 1: Group Differences in Demographic and Health Factors								- Literacy was associated with learning, memory, executive function, and fine motor tasks in older adults in Uganda, independent of education. Literacy was not associated with dementia biomarkers or neuroimaging changes. - Differences in cognitive test performance may reflect testing artifact rather than differences in cognition. Longitudinal analyses will evaluate whether literacy associated with trajectories of cognitive decline and dementia risk. - Limitations include the small number of non-literate participants with certain biomarkers (ptau217, AB4240, ptau217/AB42 ratio) and MRI-derived brain volume data.	
		Digit Span Forward	Attention	Variable	Mean (SD) Total Sample	Mean (SD) Non-literate	Mean (SD) Literate	P-value					
		Digit Span Backward	Working memory	Age	60.4 (6.4)	62.7 (7.9)	60.0 (6.0)	<.01					
		Auditory Verbal Learning Test (AVLT)	Verbal learning and memory	Sex (% female)	284/564 (50%)	73/89 (82%)	211/475 (44%)	<.001					
		Pegboard	Fine motor dexterity	HIV Status (% positive)	275/564 (49%)	38/89 (43%)	237/475 (50%)	0.21					
		Animal Fluency	Language generation	Diabetes (% positive)	43/564 (8%)	8/89 (9%)	35/475 (7%)	0.60					
		TabCAT Birdwatch	Visual associative memory	Study Site (% rural)	331/564 59%	45/89 (51%)	286/475 (60%)	0.09					
		TabCAT Favorites	Verbal and visual associative memory	Hypertension ¹ (% positive)	129/564 (23%)	21/89 (24%)	108/475 (23%)	0.66					
		TabCAT Flanker	Executive functioning/inhibition	HDL ²	1.3 (0.5)	1.3 (0.5)	1.3 (0.5)	0.71					
				Statistical Analyses:		Table 2: Regression Results							
- Chi-square and independent sample t-tests to compare demographic and mood-related factors between literate and non-literate participants. - Linear regression to examine associations between literacy and cognitive, biomarker, and neuroimaging outcomes (controlling for age, sex, education, and study site).				Cognitive Test Scores	Mean (SD) Non-literate	Mean (SD) Literate	β	Standard Error	P-value				
				Digit Span Forward	3.7 (0.2)	4.1 (0.1)	-.3	0.2	0.06				
				Digit Span Backward	3.0 (0.2)	4.0 (0.1)	-0.8	0.2	<.001				
				Flanker	4.8 (0.2)	6.0 (0.1)	0.8	0.2	0.001				
				AVLT Learning	44.3 (1.1)	47.5 (0.4)	-3.7	1.0	<.001				
				AVLT Delay	9.4 (0.3)	9.7 (0.1)	-0.6	0.3	0.05				
				AVLT Recognition Disc.	12.7 (0.3)	13.2 (0.1)	-0.6	0.2	0.01				
				TabCAT Birdwatch	13.1 (1.1)	16.7 (0.4)	-2.6	1.0	0.01				
				TabCAT Favorites Learning	8.2 (0.6)	9.2 (0.2)	-0.2	0.6	0.75				
				TabCAT Favorites Delay	3.0 (0.3)	3.2 (0.1)	0.1	0.3	0.84				
RESULTS - N=564 individuals (60±6.4years, 50% female, 49% well-treated HIV, 51% <primary school, 16% non-literate). - Non-literate participants were older, had a greater proportion of females, and higher depression symptoms. - Non-literate participants had lower scores on Digit Span Backward, AVLT learning and recognition discrimination, Birdwatch total correct, flanker, and grooved pegboard. - No significant associations between literacy and biomarker status or grey/white matter volumes were identified.				Animal Fluency	14.0 (0.6)	15.01 (0.2)	-0.2	0.5	0.74				
				Dominant Hand Pegboard	129.6 (6.3)	117.7 (2.2)	15.6	6.0	0.01				
				Nondominant Hand Pegboard	138.2 (6.4)	125.3 (2.2)	13.5	6.1	0.03				
				Biomarkers*	Mean (SD) Non-literate	Mean (SD) Literate	β	Standard Error	P-value				
				AB42/40	-2.4 (0.02)	-2.4 (0.01)	-0.04	0.03	0.28				
				GFAP	4.7 (0.05)	4.7 (0.02)	0.02	0.06	0.68				
				NfL	2.5 (0.05)	2.5 (0.02)	0.01	0.06	0.82				
				ptau217/AB42 Ratio	-5.2 (0.09)	-5.4 (0.04)	0.2	0.1	0.15				
				ptau217	-2.1 (0.09)	-2.2 (0.04)	0.1	0.1	0.27				
				MRI Volume (Brain)*	Mean (SD) Non-literate	Mean (SD) Literate	β	Standard Error	P-value				
		Grey Matter Volume	495916.0 (8550.3)	489459.7 (3420.2)	6456.2	9460.2	0.50						
		White Matter Volume	524998.4 (10307.1)	511762.4 (4123.0)	13236.0	11404.0	0.25						
		Note: Linear regression models were used to evaluate the association between literacy (coded as 1 = non-literate, 0 = literate) and cognitive test performance, biomarker measures, and total grey and white matter volumes. 1. For cognitive outcomes, models included literacy, age, sex, education, and study site. 2. For biomarker analyses, models included literacy, age, sex, and renal function (eGFR); biomarker values were log-transformed. 3. For MRI volumetric analyses, models included literacy, age, and sex. Volumes were adjusted for head size. *Sample size adjustments for biomarkers: AB42/40, ptau217, and ptau217/AB42 (43; 19% non-literate); NfL and GFAP (88; 16% non-literate); MRI brain volume (22; 15% non-literate)											