

Domain-specific Effects of Education on Cognitive Performance in Ethiopian and Kenyan Clinically Normal Adults



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Background

Alzheimer’s disease and related dementias (ADRD) prevalence in Eastern Sub-Saharan Africa (SSA) is expected to increase by 357% in the next several decades¹, yet access to valid cognitive tools in this region remains limited.

It is first critical to understand the effects of sociodemographic variables on cognitive performance in local samples given distinct demographic, cultural, and socioeconomic characteristics of SSA populations.

We examined the associations between educational attainment and performance on commonly used neuropsychological tests in clinically normal Ethiopian and Kenyan adults and qualitatively compared these associations with findings in US-based samples.

Methods

Participants were 322 clinically normal Ethiopian (n = 168) and Kenyan (n = 154) middle-aged and older adults (age: 59.4±9.2, 55% female, education: 9.7±4.5).

Measures were culturally adapted tests from the U.S. National Alzheimer’s Coordinating Center Uniform Data Set².

Cognitive Domain	Test
Processing Speed	Trail Making Test Part A
Attention	Number Span Forward
Working Memory	Number Span Backward
Visuoconstruction	Benson Figure Copy
Visual Memory	Benson Figure Recall
Category Fluency	Animal Vegetable

We performed country-specific multiple linear regression models with individual test scores as outcomes, years of education as primary predictor, and age and sex as covariates.

Unstandardized betas were qualitatively compared across countries and with those reported in the U.S. samples by Weintraub et al., 2018 (83% non-Hispanic White), Sachs et al., 2020 (83.6% non-Hispanic White), and Marquine et al., 2023 (100% Spanish-speaking Hispanic).

Results

Education was significantly associated with performance in the expected direction in both Ethiopian and Kenyan adults (Figure 1). Qualitative comparisons with U.S.-based samples (Table 2) revealed stronger effects of education in SSA adults on tests of processing speed (Trails A), attention (Number Span Forward), working memory (Number Span Backward), visuoconstruction (Benson Copy), and visual memory (Benson Recall). In contrast, effects of education were less pronounced on tasks of category fluency (Animals, Vegetables) in SSA adults compared to U.S.-published estimates.

Figure 1. Scatterplots and linear associations between educational attainment and individual test performance in Ethiopian (n = 168) and Kenyan (n = 154) adults.

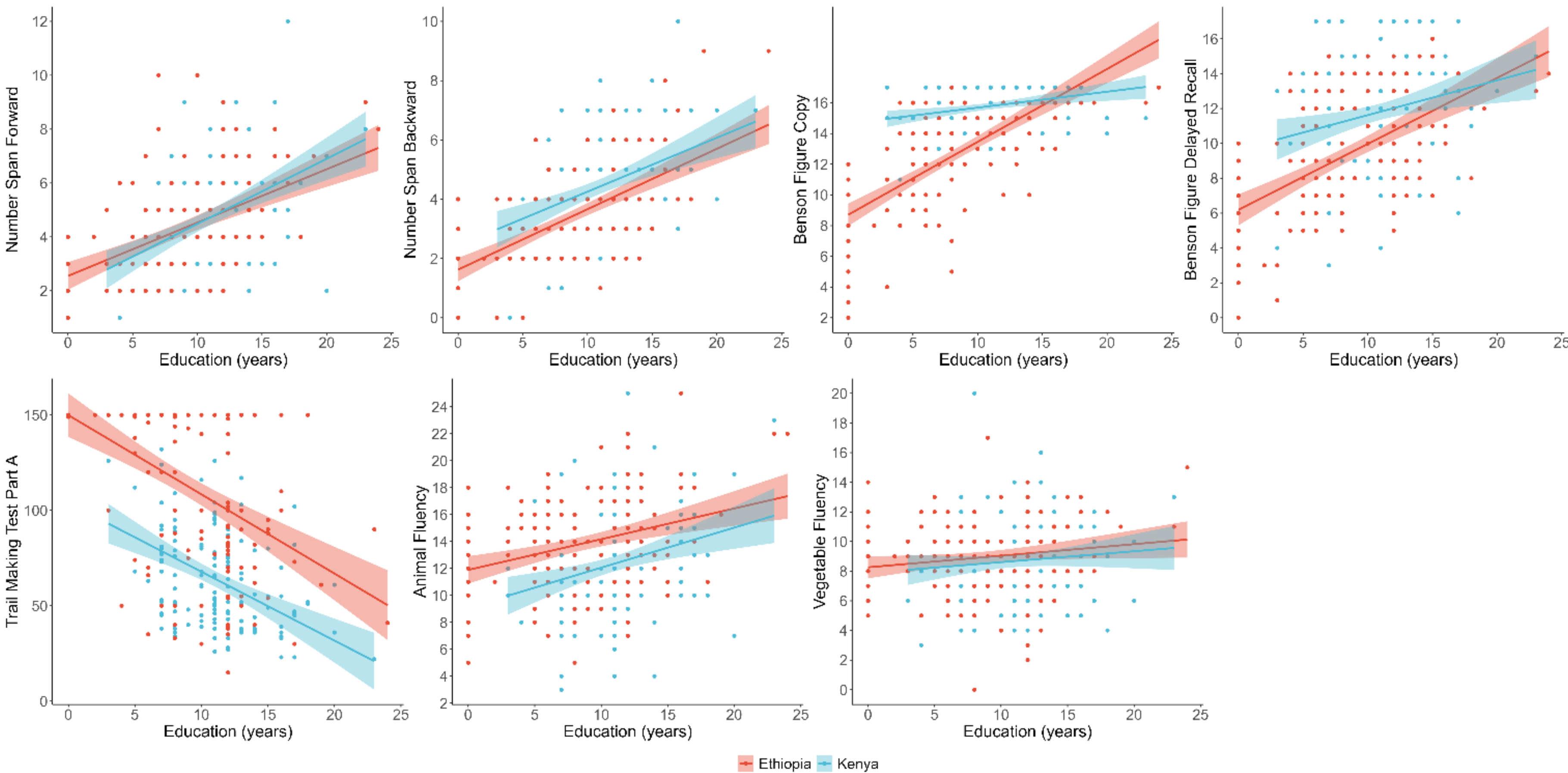


Table 2. Unstandardized beta coefficients of education (years) on individual test performance controlling for age and sex in the study samples and U.S.-based cohorts.

	Ethiopia (n = 168)	Kenya (n = 154)	Weintraub 2018 (n = 3602)	Sachs 2020 (n = 8313)	Marquine 2023 (n = 191)
Number Span Forward	0.179	0.230	0.154	0.154	0.118
Number Span Backward	0.188	0.179	0.170	0.157	0.114
Trail Making Test Part A	-3.77	-3.261	-0.731	-0.707	-2.276
Animal Fluency	0.208	0.261	0.567	0.476	0.299
Vegetable Fluency	0.169	0.103	0.312	0.262	0.118
Benson Figure Copy	0.448	0.093	0.073	0.075	0.103
Benson Figure Recall	0.336	0.115	0.157	0.136	0.178

Conclusion

This study provides important preliminary insights into distinct patterns of associations between education and cognitive performance in clinically normal middle-aged and older adults in SSA.

Our findings highlight the ongoing need for collection and generation of high-quality normative data in local samples and limited out-of-sample applicability of published neuropsychological norms.

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