Literacy Level May Mediate the Relationship Between an Individual's Ethnicity and Letter Fluency Ability

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Introduction

- In the context of neuropsychological evaluations, race/ethnicity has frequently been used as a proxy for Social Determinants of Health (SDOH) or an individual's lived social experiences.
- Among SDOH, literacy has been found to be a strong predictor of late-life cognitive functioning, especially within marginalized populations.
- Furthermore, adjusting for literacy level has been shown to attenuate, if not eliminate, most race-associated differences in neuropsychological test performance.
- Letter fluency is uniquely associated with both literacy ability and demographic factors.
- Although literacy tests remain a mainstay neuropsychological evaluations as an estimate of premorbid intellectual functioning, there is relatively little research examining the effects of literacy on cross-cultural executive functioning differences.
- **<u>Purpose:</u> Examine the degree to which an individual's literacy level mediates the association between race/ethnicity and Letter Fluency performance.**

Participants and Methods

- An age- and education-matched subsample of 56 adult outpatients with lower predicted cognitive performance were identified through K-means cluster analysis from consecutive referrals for neuropsychological evaluation at a Midwestern academic medical center. Eight patients were removed due to invalid neuropsychological performance.
- All patients were administered the following measures: Advanced Clinical Solutions Test of Premorbid Functioning (**TOPF**) and Letter Fluency.

<u>Analysis:</u> A mediation analyses was performed in SPSS using Hayes' PROCESS macro to evaluate whether literacy as measured by the TOPF mediated the association between race/ethnicity (dichotomized as Black/non-Hispanic White) and letter fluency raw scores from the F/A/S trials. Covariates of age and education were included within the analysis through a review of the literature.

Table 1. Sociodemographic characteristics for the sample stratified by race

	Overall Sample (*n* = 56)		Non-Hispanic White (*n* = 25)		Black (*n* = 31)	
	M (SD)	Range	*M* (SD)	Range	*M* (SD)	Range
Age (years)	57.38 (11.22)	34-79	54.84 (10.33)	35-75	59.42 (11.64)	34-70
Education (years)	12.55 (2.52)	8-20	13.28 (2.53)	8-20	11.97 (2.40)	8-16
TOPF-Predicted FSIQ (SS)	90.30 (11.65)	68-117	99.72 (7.48)	85-117	87.71 (8.39)	68-100
	N	%	N	%	N	%
Sex						
Male	31	55%	15	60	16	52
Female	25	45%	10	40	15	48

Table 2. Descriptive for cognitive measures comparing Black and Non-Hispanic White individuals

Cognitive Measure	Non-Hispanic White (*n* =25)		Black (*n* = 31)	
	M (SD)	Range	*M* (SD)	Range
Letter Fluency Raw	31.38 (14.74)	7-69	25.57 (13.30)	5-55

Results

Table 3. Literacy level as a mediator of the association between racial identity and letter fluency performance

Variable	*b*	95% CI	SE b	B	*F*	R2	*p*
Step 1					12.86	.45	<.001
Constant	67.05	[49.93, 86.40]	9.71				<.001
Race	-11.11	[-16.20, -5.86]	2.93	.97			<.001
Age	.29	[.06, .52]	.13				.03
Education	1.70	[.22, 2.98]	.59				.006
Step 2							
Constant	-35.56	[-66.09, -7.23]	15.17				.02
Race	6.04	[-.34, 12.22]	3.69				.108
TOPF SS	.70	[-.47, .95]	.16	.69			<.001
Age	-.48	[-.78, -.18]	.15				.003
Education	1.62	[.51, 2.97]	.71				.03
Direct effect on X on Y	6.04	[-1.38, 13.47]	3.69				
Indirect effect of X on Y	-7.80	[-12.85, -3.61]	2.36				

Note. CI = confidence interval; TOPF = Test of Premorbid Functioning; SS = standard score. Confidence intervals are constructed using 5,000 bootstrapped samples.

- Block 1 of the model was significant, with race and education emerging as significant covariates. In Block 2, the mediator was introduced, and age and education remained significant. Literacy level (via TOPF standard scores) significantly predicted variance in Letter Fluency performance in Block 2, while race was no longer a significant predictor, reflecting full mediation.

Discussion

- This study advances the literature by examining the effects of literacy on race-associated cognitive performance differences in phonemic fluency.
- Disparities in access to education and cross-cultural differences in language expression may lead to inaccurate conclusions about an individual's current ability.
- As a result, interpretations of race-associated performance differences should take into consideration the knowledge that these differences are driven by SDOH, such as varying educational quality and access to care, among other factors.
- These findings highlight the importance of neuropsychologists administering non-language-based executive functioning tests (i.e., Wisconsin Card Sorting Test, Trail Making Test Form B) when evaluation individuals with low literacy levels, as lower literacy performance may contribute to lower executive functioning scores among Black patients.
- Future directions include examining literacy performance within additional ethnoracial groups and examining other SDOH factors (i.e., socioeconomic status) and their impact on neuropsychological functioning.

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