



Association of age with attention and executive function mediated by SES



Melissa H. Kitner-Triolo, Ph.D., Janet E. Donohue, M.P.H., Michele K. Evans, M.D., and Alan B. Zonderman, Ph.D.
National Institute on Aging, Intramural Research Program, National Institutes of Health

Background. Racial differences in neuropsychological performance can in part be attributed to disparities in educational opportunities (specifically quality of education)¹ and cultural acculturation.^{2,3}

Educational opportunities are related to socioeconomic status (SES). Less and poorer quality education is related to poorer cognitive performance.¹

Illicit drug use is related to poorer cognitive performance,⁴ specifically on attention and executive function tasks.⁵

Unemployed adults and adults who never finish high school are more likely to use illicit drugs,⁶ as were lower SES adults in this study.

Study Purpose. To examine the relationship between age, attention and executive functions in three adult samples varying in race, SES, and drug use.

Specific Study Questions. Do patterns of correlations among age, a measure of attention, and a measure of executive function differ as a function of SES or race, and do the patterns of correlations differ after adjusting for educational attainment and drug use?

Participants. Three groups of participants were drawn from two studies, the Baltimore Longitudinal Study of Aging (BLSA) and the Health Aging in Nationally Diverse Longitudinal Samples (HANDLS) pilot study. Participants were selected if their Mini-Mental State Examination (MMSE) scores were greater than 24 (44 participants were excluded). Participants without valid drug use data were excluded from analyses adjusting for drug use (39 excluded).

We created three groups of participants matched on gender and age (within 5 years): (1) 89 African American participants from the HANDLS Pilot study residing in a lower SES Baltimore City neighborhood; (2) 89 higher SES African American participants from the BLSA; and 89 higher SES white participants from the BLSA.

Table 1. Numbers of participants and mean ages and educational attainments.

	BLSA-W	BLSA-B	HANDLS
N	89	89	89
Men	32	32	32
Women	57	57	57
Age (y)	60.8	60.2	60.8
Education (y)	16.3	16.3	12.1

Measures. We administered an hour-long battery of cognitive and neuropsychological tests including the Mini-Mental State Examination (MMSE) and the Wechsler Adult Intelligence Scale – Revised (WAIS-R) Digit Span Forward and Digit Span Backward tests.

Results. There were no significant differences in educational attainment between BLSA white (BLSA-W) participants and BLSA African American (BLSA-B) participants (mean = 16 years). However, HANDLS participants had significantly lower educational attainment (mean = 12 years) than both BLSA groups (Table 1).

There was a trend toward a significant correlation (Table 1) between age and WAIS-R Digits Forward in the BLSA-W group (Figure 1) and a significant correlation in the BLSA-B group (Figure 2), but not in the HANDLS group (Figure 3). There were also significant correla-

tions between age and Digits Forward Maximum Span in the BLSA-W (Figure 4) and BLSA-B (Figure 5) groups, but not in the HANDLS group (Figure 6).

There was a trend ($p < .10$) toward a significant correlation between age and WAIS-R Digits Backward in the BLSA-W (Figure 7) group, but not in the BLSA-B (Figure 8) and HANDLS (Figure 9) groups. There was a significant correlation between Digits Backward Maximum Span in the BLSA-W group (Figure 10) and a trend toward significance in the BLSA-B group (Figure 11), but not in the HANDLS group (Figure 12).

Adjusting for educational attainment yielded small changes in the correlations with age (Table 2) and there was little change in the overall relationship (Figures 1-12). Neither the unadjusted nor the adjusted correlations with age were significant in the HANDLS group, and adjusting for educational attainment and drug use had little effect.

Conclusions and Future Directions

These results suggest that age-associated changes in attention and executive tasks may differ less as a function of race than as a function of socioeconomic status.

In lower socioeconomic status African Americans, accounting for both education and drug use did not change the lack of a relationship between age and attention, and between age and executive performance.

To more fully understand these relationships, we are initiating a new study called *Healthy Aging in Neighborhoods of Diversity Across the Lifespan* to examine cognitive performance, quality of education, acculturation, drug use, and age in African Americans and whites from upper and lower socioeconomic circumstances.

References

- Manly JJ, Jacobs DM, Touradji P, Small SA, Stern Y. Reading level attenuates differences in neuropsychological test performance between African American and White elders. *J Int Neuropsychol Soc.* Mar 2002;8(3):341-348.
- Manly JJ, Jacobs DM, Sano M, et al. African American acculturation and neuropsychological test performance among non-demented community elders. *Journal of the International Neuropsychological Society.* 1998;4:77.
- Manly JJ, Miller SW, Heaton RK, et al. The effect of African-American acculturation on neuropsychological test performance in normal and HIV-positive individuals. The HIV Neurobehavioral Research Center (HNRC) Group. *J Int Neuropsychol Soc.* May 1998;4(3):291-302.
- Brook JS, Finch SJ, Whiteman M, Brook DW. Drug use and neurobehavioral, respiratory, and cognitive problems: precursors and mediators. *J Adolesc Health.* Jun 2002;30(6):433-441.
- Concha M, Selnes OA, Vlahov D, et al. Comparison of neuropsychological performance between AIDS-free injecting drug users and homosexual men. *Neuroepidemiology.* 1997;16(2):78-85.
- Substance Abuse and Mental Health Services Administration. *Results from the 2001 National Household Survey on Drug Abuse: Volume I. Summary of National Findings.* Rockville: Office of Applied Studies, NHSDA; 2002. Series H-17, DHHS Publication No. SMA 02-3758.

Table 2. Unadjusted and adjusted correlations of age with WAIS-R Digits Forward and Digits Backward

	BLSA-W	BLSA-B	HANDLS
Digits Forward – Total	-0.20 [§]	-0.28**	-0.15
Adjusted for education	-0.22*	-0.32**	-0.13
Adjusted for education & drug status	N/A	N/A	-0.02
Digits Forward – Maximum Span	-0.24*	-0.28**	-0.12
Adjusted for education	-0.26*	-0.31**	-0.09
Adjusted for education & drug status	N/A	N/A	-0.03
Digits Backward – Total	-0.19 [§]	-0.14	-0.05
Adjusted for education	-0.20 [§]	-0.19 [§]	-0.02
Adjusted for education & drug status	N/A	N/A	.03
Digits Backward – Maximum Span	-0.22*	-0.18 [§]	-0.03
Adjusted for education	-0.21*	-0.22*	-0.03
Adjusted for education & drug status	N/A	N/A	0.04

§ $p < .10$; * $p < .05$; ** $p < .01$

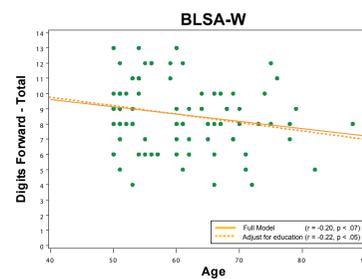


Figure 1. Association between Age and WAIS-R Digits Forward Total for BLSA Whites: Unadjusted and Adjusted Correlations after Controlling for Education

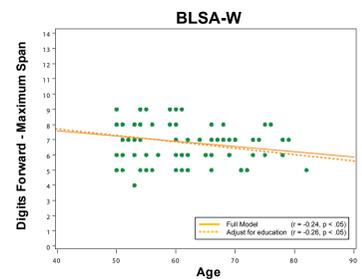


Figure 4. Association between Age and WAIS-R Digits Forward Maximum Span for BLSA Whites: Unadjusted and Adjusted Correlations after Controlling for Education

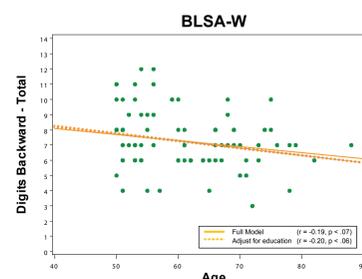


Figure 7. Association between Age and WAIS-R Digits Backward Total for BLSA Whites: Unadjusted and Adjusted Correlations after Controlling for Education

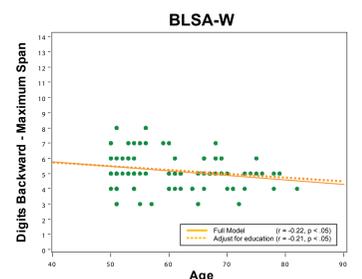


Figure 10. Association between Age and WAIS-R Digits Backward Maximum Span for BLSA Whites: Unadjusted and Adjusted Correlations after Controlling for Education

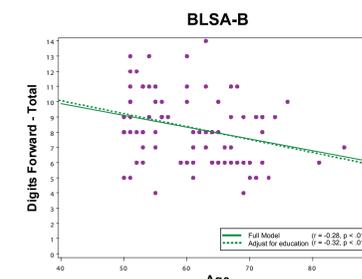


Figure 2. Association between Age and WAIS-R Digits Forward Total for BLSA African Americans: Unadjusted and Adjusted Correlations after Controlling for Education

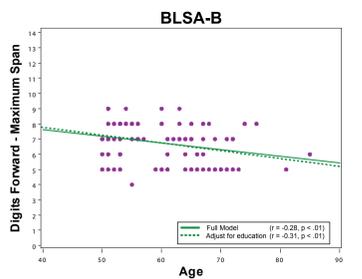


Figure 5. Association between Age and WAIS-R Digits Forward Maximum Span for BLSA African Americans: Unadjusted and Adjusted Correlations after Controlling for Education

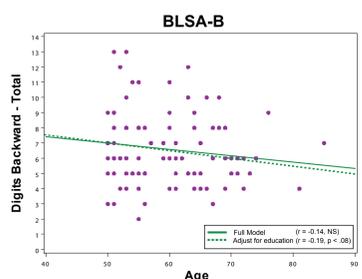


Figure 8. Association between Age and WAIS-R Digits Backward Total for BLSA African Americans: Unadjusted and Adjusted Correlations after Controlling for Education

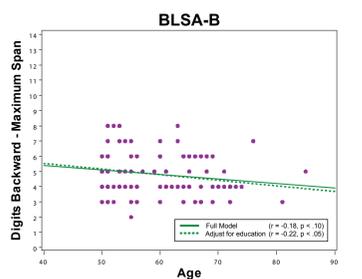


Figure 11. Association between Age and WAIS-R Digits Backward Maximum Span for BLSA African Americans: Unadjusted and Adjusted Correlations after Controlling for Education

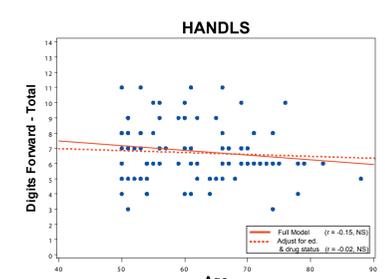


Figure 3. Association between Age and WAIS-R Digits Forward Total for HANDLS: Unadjusted and Adjusted Correlations after Controlling for Education and Drug Status

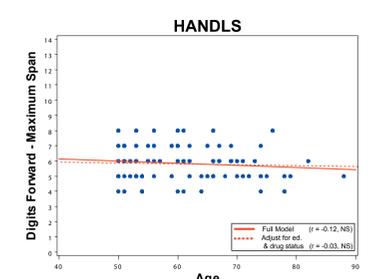


Figure 6. Association between Age and WAIS-R Digits Forward Maximum Span for HANDLS: Unadjusted and Adjusted Correlations after Controlling for Education and Drug Status

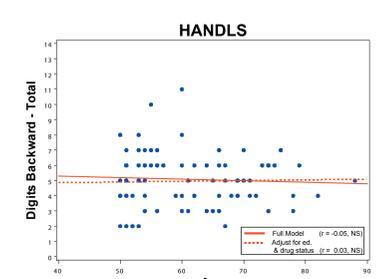


Figure 9. Association between Age and WAIS-R Digits Backward Total for HANDLS: Unadjusted and Adjusted Correlations after Controlling for Education and Drug Status

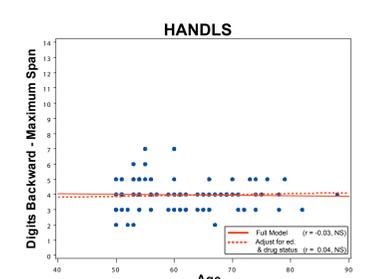


Figure 12. Association between Age and WAIS-R Digits Backward Maximum Span for HANDLS: Unadjusted and Adjusted Correlations after Controlling for Education and Drug Status