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Examining possible gender differences in the association between education and late-life cognitive function in the LifeAfter90 Study, a large multiethnic cohort of the oldest-old

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Abstract

Background: Educational attainment predicts late-life cognitive ability and dementia. Historically, women have had fewer educational opportunities than men. We examine if the association between educational attainment and cognitive level and decline differ by gender.

Method: *LifeAfter90* is an ongoing cohort of long-time members of an integrated healthcare delivery system ≥90 years old without a dementia diagnosis at recruitment. Interviews and cognitive assessment occurred every six months and included self-reported education (≤high school, some college, and ≥college graduate (reference)) and Spanish and English Neuropsychological Assessment Scales (SENAS). SENAS encompasses the domains of verbal episodic memory, semantic memory, and executive function. Mixed models with random intercepts estimated possible differences in the association between education and late-life cognition adjusting for time (years since baseline), baseline age, race/ethnicity, and practice effects. Practice effects were accounted for by using an indicator variable for the first visit. Interactions terms allowed for possible gender differences in the association of education with baseline cognitive scores (i.e. education*male) and cognitive change (i.e., education*male*time).

Result: The 669 participants were on average 92.8 years of age, 63% were women, 34% were college graduates, and 69% were racial/ethnic minorities (Table 1 and Table 2). Lower levels of education were associated with worse performance on baseline cognitive assessment but not performance over time. Women with ≤high school or some college averaged worse baseline cognition in each domain than women who had completed college (Table 3). There was no significant gender by education interaction for verbal episodic memory (p-value=0.22) or semantic memory (p-value=0.26), but the disadvantage in executive function associated with lower education was significantly attenuated in men (some college*male β=0.32, 95% CI=0.08, 0.56; p-value=0.01). There were no differences across genders in the association between education and any of the domain specific cognitive scores over time.

Conclusion: The association between education and late-life cognitive function appears to be similar across genders with the exception of college completion having a larger effect on baseline executive function scores for women than for men. We will continue to explore these differences as additional visits occur in this ongoing cohort of ethnically diverse oldest-old individuals.
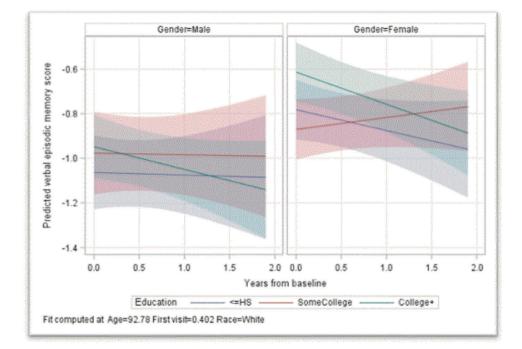

Figure 1. Predicted value of verbal episodic memory scores by gender

FIGURE 1

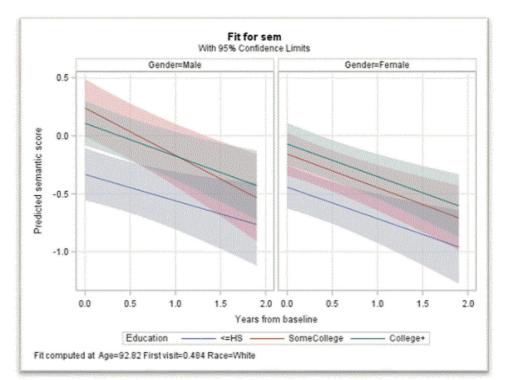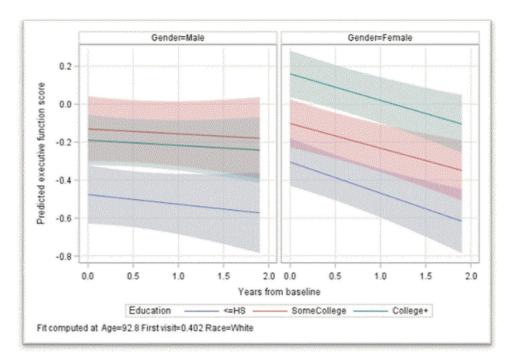## Figure 2. Predicted value of semantic memory scores by gender

FIGURE 2

TABLE 1

Table 1. Baseline characteristics of participants by gender: The *LifeAfter90* Study

Characteristic	Females N (%)	Males N (%)	Overall N (%)
No. of Participants	418 (62.5%)	251 (37.5%)	669 (100%)
Average Age, y (range)	92.9 (90-103)	92.7 (90-105)	92.8 (90-105)
Education			
≤High School	157 (37.6)	86 (34.3)	243 (36.3))
Some College	138 (33.0)	60 (23.4)	198 (29.6)
≥College degree	123 (29.4)	105 (41.8)	228 (34.08)
Race/ethnicity			
White	127 (30.4)	81 (32.3)	208 (31.1)
Latino	71 (17.0)	42 (16.7)	113 (16.9)
Black	102 (24.4)	43 (17.3)	145 (21.7)
Other/Multiple	40 (9.6)	17 (6.8)	57 (8.5)
Asian	78 (18.7)	68 (27.1)	146 (21.8)

Figure 3. Predicted value of executive function scores by gender

FIGURE 3

TABLE 2

Table 2. Distribution of domain-specific SENAS scores across the first 4 visits by gender

	Visit 1			Visit 2			Visit 3			Visit 4		
	N	Mean	std	N	Mean	std	N	Mean	std	N	Mean	std
Verbal episodic memory												
Men	250	-1.06	0.64	183	-0.93	0.65	124	-0.72	0.72	57	-1.01	0.72
Women	415	-0.82	0.66	325	-0.70	0.73	217	-0.61	0.83	83	-0.73	0.78
Semantic memory												
Men	245	-0.67	1.03	163	-0.65	1.18	104	-0.58	1.03	0	.	.
Women	406	-0.92	0.94	274	-0.86	1.00	151	-0.81	0.91	3	0.01	0.81
Executive function												
Men	251	-0.64	0.70	185	-0.49	0.67	126	-0.30	0.67	58	-0.39	0.71
Women	417	-0.48	0.72	325	-0.39	0.68	217	-0.28	0.70	84	-0.36	0.69

TABLE 3

Table 3. Association between education and domain-specific cognitive function

	Verbal episodic memory β (95% CI)	Semantic memory B (95% CI)	Executive function B (95% CI)
Intercept	4.59 (2.84, 6.34)	5.68 (3.12, 8.25)	4.81 (3.09, 6.53)
Time	-0.14 (-0.26, -0.03)	-0.28 (-0.42, -0.14)	-0.14 (-0.21, -0.07)
Baseline age	-0.06 (-0.07, -0.04)	-0.06 (-0.09, -0.03)	-0.05 (-0.07, -0.03)
First visit	-0.18 (-0.27, -0.09)	-0.06 (-0.15, 0.03)	-0.13 (-0.19, -0.07)
Male	-0.33 (-0.51, -0.16)	0.18 (-0.05, 0.41)	-0.35 (-0.51, -0.19)
≤High School	-0.17 (-0.33, -0.01)	-0.37 (-0.59, -0.16)	-0.46 (-0.61, -0.32)
Some college	-0.26 (-0.42, -0.10)	-0.09 (-0.30, 0.13)	-0.26 (-0.41, -0.11)
≥College degree	Ref	Ref	Ref
Latino	0.01 (-0.14, 0.15)	-0.74 (-0.95, -0.53)	-0.52 (-0.66, -0.37)
Black	0.10 (-0.02, 0.23)	-1.06 (-1.24, -0.87)	-0.40 (-0.52, -0.27)
Other/Multiple	0.08 (-0.09, 0.26)	-0.71 (-0.97, -0.46)	-0.33 (-0.51, -0.16)
Asian	0.08 (-0.05, 0.21)	-1.06 (-1.24, -0.88)	-0.43 (-0.55, -0.30)
White	Ref	Ref	Ref
≤High School * Male	0.05 (-0.19, 0.30)	-0.07 (-0.40, 0.26)	0.18 (-0.05, 0.40)
Some college * Male	0.23 (-0.04, 0.49)	0.22 (-0.13, 0.57)	0.32 (0.08, 0.56)
≥College degree * Male	Ref	Ref	Ref
Male* Time	0.04 (-0.11, 0.19)	0.00 (-0.17, 0.16)	0.11 (0.01, 0.21)
≤High School * Time	0.05 (-0.09, 0.19)	0.01 (-0.16, 0.18)	-0.03 (-0.12, 0.07)
Some college * Time	0.20 (0.06, 0.34)	-0.01 (-0.16, 0.14)	0.01 (-0.08, 0.10)
≥College degree * Time	Ref	Ref	Ref
≤High School* Male * Time	0.04 (-0.20, 0.27)	0.05 (-0.21, 0.31)	0.00 (-0.15, 0.15)
Some college * Male * Time	-0.10 (-0.33, 0.13)	-0.12 (-0.37, 0.14)	-0.01 (-0.16, 0.14)
≥College degree * Male * Time	Ref	Ref	Ref