Relationship Between Parental History of Dementia, Motor-Cognitive and Executive Function Performance in African American Women

Allison A. Bay, MPH[a], Nicole Schindler[a,b], Whitney Wharton, PhD[c], Hayley Silverstein[a], Liang Ni, MPH[a], Todd A. Prusin MSLS[a], Madeleine E. Hackney, PhD[a,c,d,e,f]

[a]Emory University School of Medicine, Department of Medicine, Division of Geriatrics & Gerontology, [b]Emory College of Arts and Sciences, [c]Emory University School of Nursing, [d]Atlanta VA Center for Visual & Neurocognitive Rehabilitation, [e]Emory University School of Medicine, Department of Rehabilitation Medicine, [f]Birmingham/Atlanta VA Geriatric Research Education and Clinical Center

Division of Geriatrics and Gerontology

Atlanta VA RR&D

Introduction

- People with parental history (PH) of Alzheimer's Disease (AD) and Alzheimer's Disease and related dementias (ADRD) are at risk for dementia[1]
- ADRD are more prevalent in African Americans and women, likely due to complex interactions between genetics and environmental factors including allostatic load (cumulative impact of stress) and, for African American women, systemic and individual racism[2-3]
- Declines in executive function and motor-cognitive integration can impair functional skills[4]
- Monitoring cognitive and psychosocial function in individuals with a PH of ADRD is important for early interventions to delay or prevent ADRD onset

Methods

This secondary data analysis study compared 58 African American women with PH of ADRD versus without PH on motor-cognitive and executive function and mental and physical quality of life using point biserial correlations and linear regression.

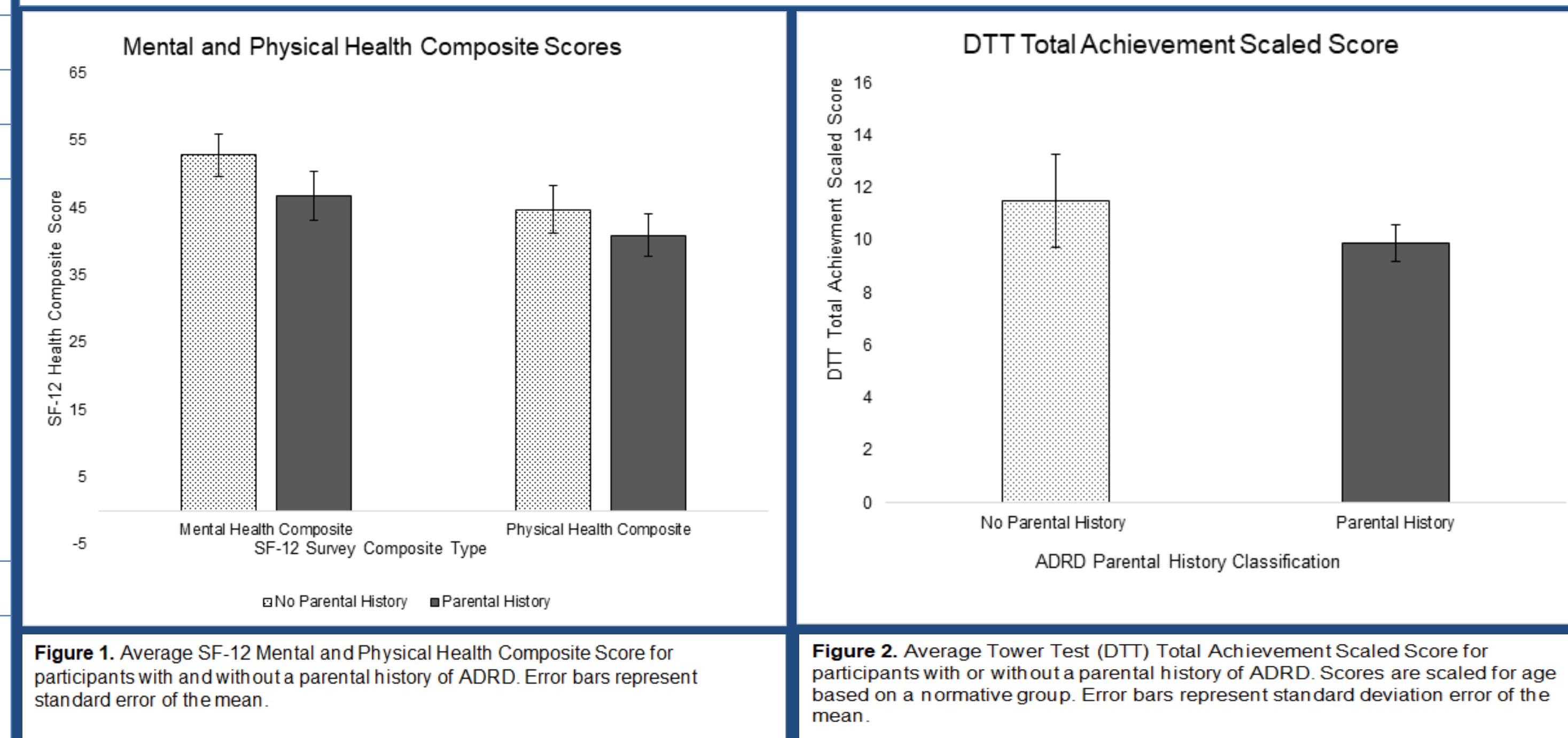### Table 1. Characteristics of the Sample Including Individuals with and without Parental History of ADRD

	Sample (n=58) Mean (SD)/N (%)	History (n=34) Mean (SD)/N(%)	No History (n=24) Mean (SD)/N(%)	P-Value
Age[a] (years)	63.2 (7.3)	61.7 (7.4)	65.2 (6.7)	0.069
Year of Education [a]	14.2 (2.4)	13.8 (2.5)	14.5 (2.3)	0.265
Montreal Cognitive Assessment (/30) [a]	25.2 (3.1)	24.7 (3.5)	25.6 (2.8)	0.286
Physical Activity Scale for the Elderly[a]	124.5 (60.8)	113.5 (59.2)	132.7 (61.7)	0.245
Occupational Status[b]				0.768
Work full-time	15(25.9)	10(29.4)	5(18.5)	
Work part-time	8(13.8)	4(11.8)	4(14.8)	
Homemaker	1(1.7)	0(0)	1(3.7)	
Retired	29(50.0)	16(47.1)	13(55.6)	
Unemployed/seeking work	1(1.7)	1(2.9)	0(0)	
Disabled	4(6.9)	3(8.8)	1(7.4)	
Body Mass Index[a] (kg/m²)	30.0 (5.6)	30.0 (5.1)	30.2 (6.4)	0.844
Hypertension				0.778
Yes	39(67.2)	22(64.7)	17(70.8)	
No	19(32.8)	12(35.3)	7(29.2)	
Number of Falls in the Past Year[a]	0.6(1.7)	0.5(0.9)	0.7(2.4)	0.734
Fall Worry[b]				0.225
Not at All	29(50.9)	17(51.5)	12(50.0)	
A Little	22(38.6)	12(36.4)	10(41.7)	
Moderately	6(10.5)	4(12.1)	2(8.3)	
High	0(0)	0(0)	0(0)	
Marital Status[b]				0.141
Single	5(8.8)	2(5.9)	3(13.0)	
Married/Partnered	22(38.6)	12(35.3)	10(43.5)	
Divorced	19(33.3)	15(44.1)	4(17.4)	
Widowed	11(19.3)	5(14.7)	6(26.1)	
Assistive Device Use[b]				p>0.99
Yes	4(6.9)	2(5.9)	2(8.3)	
No	54(93.1)	32(94.1)	22(91.7)	
Times Leaving House per Week[b]				0.063
Four Times per Week or Fewer	25(43.1)	11(41.7)	14(58.3)	
Everyday	33(56.9)	23(67.6)	10(41.7)	

[a]Two-tailed, independent T-Tests were used for continuous variables ; [b]Fisher's exact tests were used for categorical variables ; [*]P values indicate significant differences between Parental History and No Parental History Groups at the 0.05 level

Results

Table 2. Point Biserial Correlations between Parental History and performance on Motor, Cognitive, Motor-Cognitive, and Executive Function Tasks

Assessment	Correlation Coefficient [95% Confidence Interval]
Timed Up and Go (seconds)	-0.169 [-0.411-0.096]
Montreal Cognitive Assessment (/30)	0.143 [-0.120-0.387]
Body Position Spatial Task (product of score and span)	0.158 [-.104-0.401]
Four Square Step Test (seconds)	-0.117 [-0.367-0.148]
Timed Up and Go-Cognitive (seconds)	-0.184 [-0.424-0.080]
Timed Up and Go percent time change[c] (%)	-0.010 [-0.270-0.251]
DKEFS Tower Test Total Achievement score (scaled) Total Achievement Scaled Score	**-0.256 [-0.483-0.002]**
DFKES Color-Word Interference	
Inhibition Scaled Score	-0.024 [-0.280-0.236]
Inhibition/Switching Scaled Score	0.192 [-0.088-0.414]
Inhibition Errors Scaled Score	0.152 [-0.111-0.395]
Inhibition/Switching Errors Scaled	0.171 [-0.091-0.411]
Trails B-A Difference score (seconds)	-0.118 [-0.365-0.145]
SF-12 Survey	
Mental Health Composite Score	**-0.302[-0.520- -0.048]**
Physical Health Composite Score	**-0.204 [-0.439-0.057]**

[c]Formula: (Tug−cog)−TUG TUG (Tug−cog)− TUG* 100%

Figure 1. Average SF-12 Mental and Physical Health Composite Score for participants with and without a parental history of ADRD. Error bars represent standard error of the mean.

Figure 2. Average Tower Test (DTT) Total Achievement Scaled Score for participants with or without a parental history of ADRD. Scores are scaled for age based on a normative group. Error bars represent standard deviation error of the mean.

Discussion

- Point biserial correlations indicate correlations of moderate effect size between family history and Mental and Physical Health Composite Score with those with a family history having worse scores
- Weak or small effect sizes with no significant associations were seen for the other variables investigated
- After adjusting for the number of times participants left the house weekly, BMI, and hypertension, we observed differences between those with and without PH on the DTT task, a common test of planning/organization ability
- Participants scored relatively high on the global screen with an average MoCA score of 25, compared to data from a large study which established a score of 22 as normative among African American adults[5]

Results

Table 3. Performance on Motor-Cognitive and Executive Function Tasks and SF-12 Surveys between Groups[1]

	Parental History, n=34, Mean (SD) [range]	No Parental History n=24, Mean (SD) [range]	Model 1[a]			Model 2[b]		
			β	p	R²	β	p	R²
Montreal Cognitive Assessment (/30)	25.6 (2.8) [18,30]	24.7 (3.5) [14,30]	0.59	0.491	0.053	0.59	0.499	0.057
Timed Up and Go (seconds)	8.2 (2.6) [5.6,20.9]	n=23 9.3 (4.0) [5.6,24.9]	-0.63	0.471	0.116	-0.73	0.403	0.170
Body Position Spatial Task (product score)	16.6 (9.9) [4,49]	14.0 (4.6) [9,20]	2.86	0.213	0.028	2.78	0.229	0.051
Four Square Step Test (seconds)	9.5 (2.0) [6,14.6]	n=23 10.2 (3.6) [6.3,23.5]	-0.40	0.600	0.047	-0.51	0.480	0.173
Timed Up and Go-Cognitive (seconds)	11.6(3.8) [6.6,22]	n=23 13.3 (5.5) [6.5,28.8]	-1.24	0.326	0.076	-1.43	0.227	0.22
Timed Up and Go cost[c] (%)	43.6 (37.0) [-6.15,135.55]	n=23 44.4 (32.0) [0.2,143.8]	-2.86	0.771	0.015	-3.45	0.720	0.093
DKEFS Tower Total Achievement score (scaled)	9.9 (2.0) [6,15]	11.5 (4.3) [6,23]	-1.78	0.046*	0.071	-1.78	0.050*	0.081
DFKES Color Word Interference								
Inhibition Scaled Score	10.6 (2.4) [3,14]	10.7 (2.8) [5,15]	-0.19	0.795	0.003	-0.19	0.797	0.019
Inhibition/Switching Scaled Score	10.3(2.4) [4,14]	9.3 (3.2) [1,15]	0.86	0.281	0.039	0.86	0.290	0.045
Inhibition Errors Scaled Score	10.8 (2.2) [1,13]	10.0 (3.2) [1,13]	0.63	0.401	0.042	0.60	0.417	0.096
Inhibition/Switching Errors Scaled	10.5(2.3) [5,13]	9.5 (3.4) [1,14]	0.75	0.335	0.050	0.75	0.345	0.050
Trails B-A Difference score (seconds)	46.4 (26.3) [16.4,109.3]	53.1 (31.0) [8.4,125.3]	-4.62	0.557	0.033	-4.66	0.555	0.062
SF-12								
Mental Health Composite Score	46.8(10.7) [2.5,59.4]	52.8(7.8) [36.3,62.6]	-7.17	0.007*	0.144	-7.14	0.008*	0.154
Physical Health Composite Score	40.9(9.3) [19.4,61.4]	44.7 (8.6) [28.9,60.5]	-5.60	0.023*	0.165	-5.60	0.025*	0.176

[a]Model 1: Linear Regression adjusting for number of times leaving the house comparing Parental History and No Parental History Groups ; [b]Model 2: Linear Regression adjusting for number of times leaving the house, body mass index, and hypertension comparing Parental History and No Parental History Groups; [c]Formula: ((Tug−Cog)−TUG TUG) (Tug−Cog)−TUG TUG)* 100%; *P values indicate significant differences between Parental History and No Parental History Groups at the 0.05 level

Conclusions

- African American women at risk for ADRD may exhibit a decline in executive function and physical and mental quality of life before memory deficits meet the criterion for ADRD diagnosis
- Motor-Cognitive tasks may be preserved despite deficiencies in executive function

Relevance of Findings

- Executive function and mental and physical health-related QOL may be important targets for identifying individuals at increased risk for ADRD and developing appropriate rehabilitative interventions
- Future studies should analyze allostatic load and caregiver status, as these may contribute to ADRD risk
- Understanding the interplay of factors contributing to ADRD is key to preserving cognitive function

References

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