

Association Of Cognitive And Brain Reserve Proxies With Superaging In South Korea

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Introduction

Superior cognitive performance in older ages has been linked to cognitive and brain reserve. Superagers are older adults with cognitive performance superior to that expected for their age. We examined the association of proxy measures of cognitive and brain reserve with superaging in a South Korean sample.

Methods

The sample included cognitively normal adults aged 50+ years from the Korean Brain Aging Study for the Early Diagnosis and Prediction of Alzheimer’s disease (KBASE) baseline assessment. Brain reserve proxies were brain parenchymal fraction (BPF) and intracranial volume (ICV). BPF was calculated as the sum of gray and white matter volumes divided by ICV. The cognitive assessment was based on the Korean version of the CERAD neuropsychological assessment protocol. Cognitive reserve was measured as the residuals of a linear regression using hippocampal volume, total gray matter volume, and cortical thickness as exposures, and categorized as high (residuals > 0 SD from the sample mean) or low (residuals ≤ 0 SD from the sample mean). Participants aged 75+ years were classified as typical cognitive agers or superagers (those who scored at or above 1 SD from the mean of a younger control group on episodic memory and no lower than -1 SD from the normative mean for their age group on language and executive function tests). Logistic regression models investigated the association of BPF, ICV, and cognitive reserve with superaging, adjusted for age, sex and education.

Results

Table 1. Participant characteristics (n = 163)

	Younger controls n=74	Typical agers n=22	Superagers n=67	Overall n=163	p-value
Age, mean (SD)	57.0 (2.80)	77.9 (3.18)	78.5 (3.21)	68.6 (11.1)	<0.001
Sex, n (%)					0.89
Men	42 (56.8%)	11 (50.0%)	34 (50.7%)	87 (53.4%)	
Women	32 (43.2%)	11 (50.0%)	33 (49.3%)	76 (46.6%)	
Education, mean (SD)	13.7 (3.82)	12.0 (5.24)	10.9 (5.34)	12.3 (4.84)	0.009
Intracranial volume (cm³), mean (SD)	1500 (157)	1420 (169)	1440 (162)	1460 (163)	0.097
Parenchymal volume (cm³), mean (SD)	1160 (110)	1040 (125)	1080 (105)	1110 (119)	<0.001
Total hippocampus volume (cm³), mean (SD)	8.150 (0.722)	7.200 (0.929)	7.130 (0.638)	7.610 (0.875)	<0.001
Total gray matter volume (cm³), mean (SD)	623 (54.3)	553 (83.3)	569 (66.7)	592 (70.1)	<0.001
Global cortical thickness (mm), mean (SD)	2.57 (0.139)	2.40 (0.334)	2.42 (0.276)	2.48 (0.245)	0.001
Cortex volume (cm³), mean (SD)	456 (45.9)	403 (74)	413 (60.5)	431 (60.7)	<0.001
Cognitive reserve (%)					<0.001
Low reserve	14 (18.9%)	21 (95.5%)	41 (61.2%)	76 (46.6%)	
High reserve	60 (81.1%)	1 (4.5%)	24 (35.8%)	85 (52.1%)	

SD = standard deviation

Table 2. Association of brain reserve and cognitive reserve with superaging.

	Unadjusted		Model 1	
	OR (95% CI)	p	OR (95% CI)	p
Intracranial volume	1.12 (0.69 – 1.85)	0.644	1.53 (0.74 – 3.32)	0.265
Brain parenchymal fraction	1.38 (0.87 – 2.28)	0.184	1.49 (0.88 – 2.64)	0.149
Cognitive reserve	12.29 (2.33 – 227.26)	0.017	29.72 (4.78 – 592.66)	0.003

Model 1: Logistic regression adjusted for age, sex and education.

Conclusion

Our findings point to a complex link between structural and functional changes in superagers, and indicate that these patterns may vary across populations. These results emphasize that public policies designed to preserve cognitive reserve should target a wide population. Additional research on cognitive and brain reserve in culturally and linguistically diverse populations is needed to support broader generalization.

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