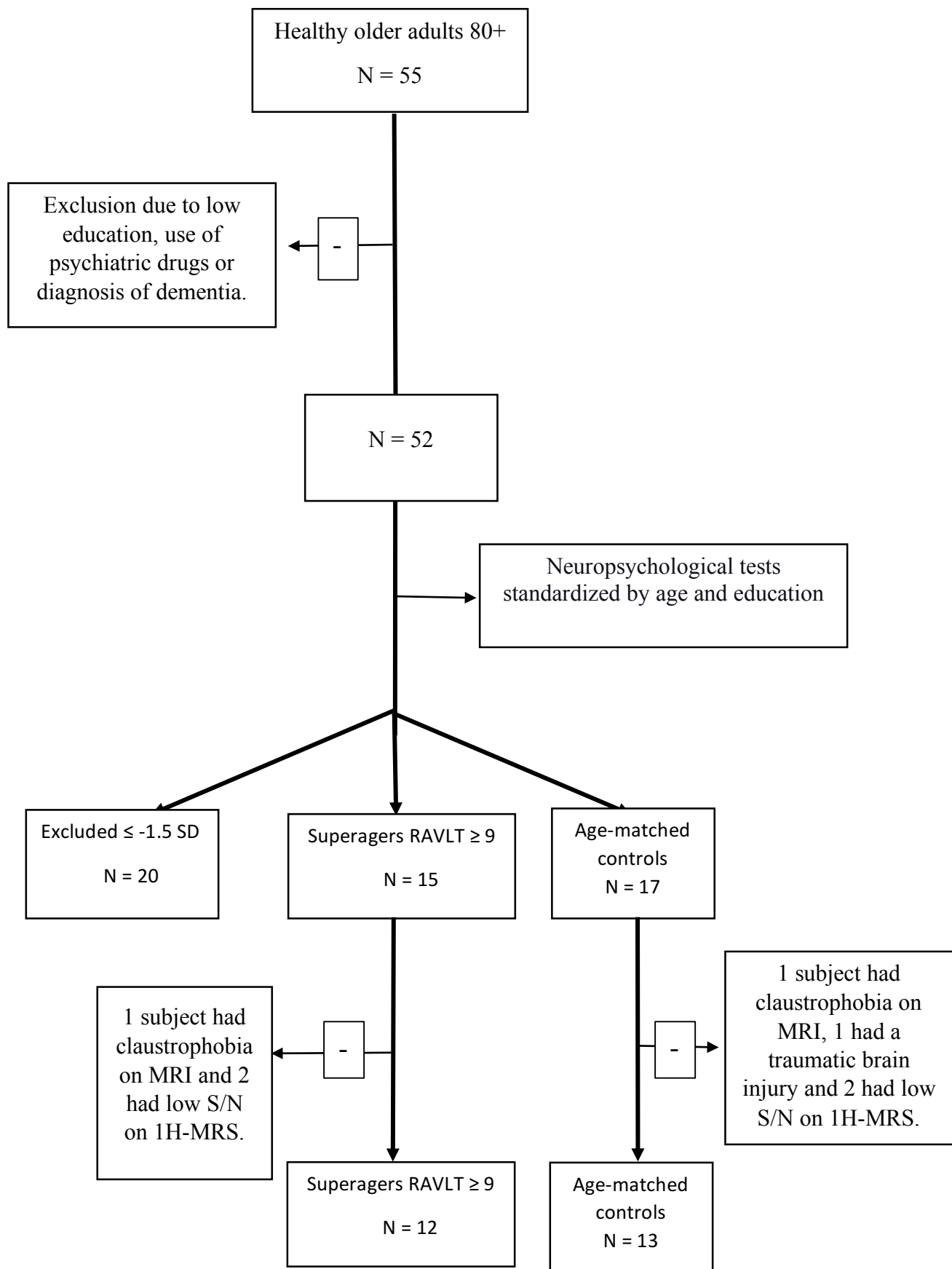




Supplemental figure 1: Flowchart of patient selection and inclusion criteria for our cohort.

Abbreviation: S/N signal-to-noise ratio

Supplemental Table 1. Demographic information and neuropsychological test scores

	Age-matched controls (n = 13)		Superagers (n = 12)		p-value
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Age (y)	84.38 (3.97)	84.00 (5.5)	83.42 (3.53)	82.00 (5.80)	0.54 ^q
Education (y)	14.54 (3.91)	16.00 (3.00)	15.92 (5.07)	17.50 (7.80)	0.27 ^a
Gender (%, male)	10 (76.90)		6 (50.00)		0.16 ^b
Psychiatric disorder (%)	1 (8.30)		1 (8.30)		0.76 ^b
Heart disease (%)	3 (25.00)		2 (16.70)		0.50 ^b
Hypothyroidism (%)	2 (16.70)		3 (25.00)		0.50 ^b
Dyslipidemia (%)	3 (25.00)		2 (16.70)		0.50 ^b
Diabetes mellitus (%)	2 (16.70)		3 (25.00)		0.50 ^b
Systemic arterial hypertension (%)	7 (58.30)		7 (58.30)		0.66 ^b
RAVLT Delayed Recall ^c	5.89 (1.52)	6.00 (2.00)	11.08 (1.44)	12.00 (2.80)	< 0.001 ^a
MMSE ^d	28.38 (0.96)	28.00 (1.00)	28.92 (1.08)	29.00 (2.00)	0.27 ^a
MoCA ^e	23.54 (1.33)	24.00 (1.5)	26.50 (1.98)	27.00 (1.8)	0.001 ^a

BCSB Delayed Recall^f	7.0 (1.68)	7.00 (3.50)	8.58 (1.16)	8.00 (2.00)	0.019^a
Clock Drawing Test	9.46 (0.78)	10.00 (1.00)	9.00 (2.26)	10.00 (1.00)	0.98 ^a
Verbal Fluency (Animals)	16.31 (4.23)	16.00 (5.50)	19.50 (6.38)	18.00 (7.80)	0.18 ^a
Verbal Fluency (FAS)	40.69 (14.57)	34.00 (23.50)	45.75 (13.99)	43.00 (19.80)	0.32 ^a
Logical Memory	18.77 (7.92)	17.00 (11.00)	28.75 (5.15)	27.50 (5.80)	0.005^q
Rey Complex Figure (Copy)	32.89 (4.98)	34.00 (4.50)	35.67 (0.78)	36.00 (0.00)	0.07 ^a
Rey Complex Figure (Delayed Recall)	12.00 (4.76)	11.00 (8.80)	15.46 (5.63)	17.25 (8.00)	0.11 ^a
Trail Making A	48.54 (14.66)	47.00 (19.50)	49.17 (13.09)	51.00 (22.50)	0.98 ^a
Trail Making B	124.15 (51.40)	113.00 (66.50)	108.33 (39.64)	107.00 (65.80)	0.47 ^a
Forward Digit Span	7.77 (1.64)	8.00 (3.00)	9.25 (2.42)	9.00 (2.80)	0.11 ^a
Backward Digit Span	4.85 (2.11)	5.00 (3.00)	6.08 (1.24)	6.00 (2.00)	0.08 ^a
BNT- 60^g	54.92 (4.75)	56.00 (7.50)	56.83 (3.66)	58.00 (6.50)	0.29 ^a

Supplemental table 1. Abbreviations: **a.** Mann-Whitney Test; **b.** Fisher's Exact Test; **c.** Rey Auditory Verbal Learning Test (RAVLT); **d.** Mini Mental State Examination (MMSE); **e.** Montreal Cognitive Assessment (MoCA); **f.** Brief Cognitive Screening Battery (BCSB); **g.** Boston Naming Test (BNT-60)

Supplemental Table 2. Metabolites' concentrations

Average metabolites' concentrations			Weighted means of metabolites' concentrations			
Posterior Cingulate Cortex						
	Superagers	Age-matched Controls	P	Superagers	Age-matched Controls	P
NAA+NAAG	13.06 (0.25)	12.05 (0.31)	0.02	12.87 (0.71)	12.09 (0.94)	0.03
NAA+NAAG/ Cr+PCr	1.53 (0.03)	1.45 (0.03)	0.06	1.50 (0.10)	1.45 (0.09)	0.69
mI	6.26 (0.18)	5.56 (0.30)	0.06	6.29 (0.62)	5.76 (0.90)	0.09
PCr	5.95 (0.16)	5.83 (0.33)	0.76	5.83 (0.58)	5.67 (0.91)	0.62
Cr+PCr	8.53 (0.17)	8.32 (0.23)	0.49	8.56 (0.55)	8.25 (0.78)	0.28
Gln	4.68 (0.35)	4.57 (0.34)	0.82	4.45 (0.10)	4.48 (1.21)	0.94
Glu	10.89 (0.30)	10.19 (0.35)	0.15	10.69 (0.96)	10.19 (1.14)	0.54
Glu+Gln	15.57 (0.60)	14.76 (0.57)	0.33	15.18 (1.81)	14.70 (1.92)	0.23
GPC+PCho	1.90 (0.07)	1.82 (0.05)	0.35	1.87 (0.23)	1.82 (0.19)	0.63
GSH	1.65 (0.12)	1.76 (0.11)	0.52	1.66 (0.38)	1.73 (0.37)	0.67
Tissue composition in the examined volume of interest						

GMf	0.65 (0.01)	0.64 (0.02)	0.85
WMf	0.15 (0.01)	0.12 (0.01)	0.04
CSFf	0.20 (0.02)	0.24 (0.02)	0.17
Tissuef	0.80 (0.02)	0.76 (0.02)	0.20

Supplemental table 2. Metabolite concentrations with CRLB < 20% are expressed in mM (millimols) for both analyses, namely the average metabolites' concentrations and their weighted means. The standard error of the means is displayed in brackets. The p-value for any significant differences for metabolite concentrations and weight is set at < 0.05.

Abbreviations: NAA+NAAG, *N*-acetyl aspartate+N-acetylaspartyl glutamate; mI, Myo-inositol; PCr; phosphocreatine; Cr+PCr, Creatine+phosphocreatine; Gln, glutamine; Glu, Glutamate; Glu+Gln, Glutamate+Glutamine; GPC+PCho, Glycerophosphocholine+phosphocholine; GSH, Glutathione. GMf, gray matter fraction; WMf, white matter fraction; CSFf, cerebrospinal fluid fraction; Tissuef, tissue fraction. The fractions are ratios of the volume taken up by GM, WM, CSF and tissue to the total volume of the 1H-MRS VOI.

Supplemental Table 3

Mean Weights		
Posterior Cingulate Cortex		
	Superagers	Age-matched Controls
NAA+NAAG	9.92	8.59
mI	15.77	14.54
PCr	2.05	2.06
Cr+PCr	24.50	23.93
Gln	2.05	1.90
Glu	2.80	2.55
Glu+Gln	1.58	1.53
GPC+PCho	216.55	214.36
GSH	14.66	12.76

Supplemental table 3. Mean weights calculated using the following equation to estimate the

weight (w_i) of each metabolite: $w_i = \frac{1}{[C_i (\frac{R_i}{100})]^2}$

Abbreviations: NAA+NAAG, *N*-acetyl aspartate+N-acetylaspartyl glutamate; mI, Myo-inositol; PCr; phosphocreatine; Cr+PCr, Creatine+phosphocreatine; Gln, glutamine; Glu, Glutamate; Glu+Gln, Glutamate+Glutamine; GPC+PCho, Glycerophosphocholine+phosphocholine; GSH, Glutathione.