

Figure S1. Differences in global gray matter between metabolically healthy and metabolically unhealthy obese (Panel A) and associations between global gray matter and academic achievement (Panel B) in only obese children. β : beta standardized coefficients. MHO: Metabolically healthy overweight/obesity. MUO: Metabolically unhealthy overweight/obesity. VO₂max: maximum oxygen consumption. * Basic confounders were sex, peak height velocity (Panel A) or age (Panel B), parental education level (none/one/both of them), and body mass index (kg/m²).

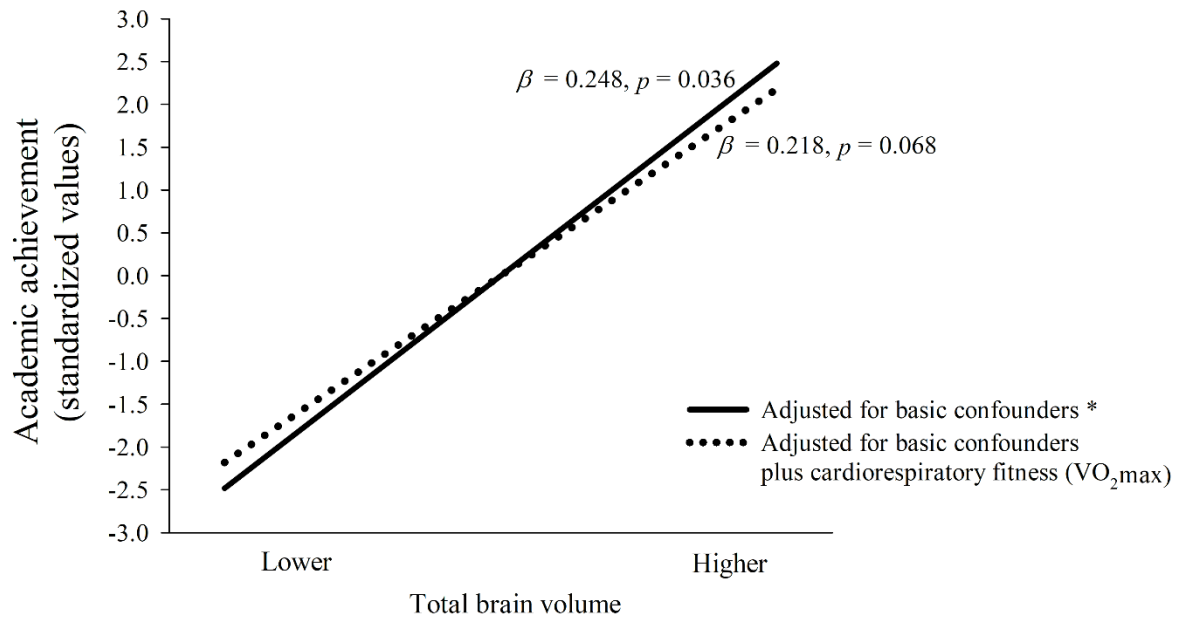


Figure S2. Associations between total brain volume and academic achievement in overweight and obese children. β = beta standardized coefficients. * Basic confounders were sex, age, parental education level (none/one/both of them), and body mass index (kg/m²).

Table S1. Jolliffe and Janssen [10] criteria for classification of metabolically healthy and unhealthy phenotypes.

Years	Waist Circumference (cm)	Triglycerides (mg/dL)	Glucose (mg/dL)	HDL Cholesterol (mg/dL)	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
Boys:						
12	≥85.1	≥127.40	≥100.97	≥43.70	≥121	≥76
Girls:						
12	≥72.5	≥141.60	≥100.97	≥48.34	≥121	≥80

HDL: High-density lipoprotein.

Table S2. Brain regions showing gray matter volume increases in metabolically healthy ($n = 33$) compared to metabolically unhealthy ($n = 40$) obese children.

Metabolically healthy ($n = 33$) > Metabolically unhealthy ($n = 40$)								
Brain Regions	x	y	z	t	Cluster Size	Hemisphere	Effect Size	
							Cohen's d	95% CI
Model 1:								
Lingual gyrus	23	-72	-6	4.04	111	Right	0.89	0.40,1.36
	-18	-69	-3	3.62	35	Left	0.77	0.28,1.24
Fusiform gyrus	44	-33	-20	3.76	53	Right	0.88	0.39,1.35
Model 2:								
Lingual gyrus	23	-72	-6	3.68	70	Right	0.80	0.31,1.27
Fusiform gyrus	44	-33	-20	3.49	37	Right	0.80	0.31,1.27

95% CI: 95% of confidence interval. Model 1 was adjusted by sex, peak height velocity (years), parental education level (none/one/both of them), and body mass index (kg/m^2). Model 2 was adjusted for model 1 plus cardiorespiratory fitness (VO_2max). All contrasts were thresholded using AlphaSim at $p < 0.001$ with $k = 33$ voxels (Model 1) and $k = 25$ voxels (Model 2) and surpassed Hayasaka correction. Anatomical coordinates (x, y, z) are given in Montreal Neurological Institute (MNI) Atlas space.