

Life-course Body Shape trajectories and Cerebral Oxygen Metabolism in Community-Dwelling older adults



Yifan Yan, MSc^{1,2}, Yaping Zhang, MPH^{1,2}, Xuhao Zhao, MPH^{1,2}, Renwei Chen, MPH^{1,2}, Shenghao Fang, BS^{1,2}, Yi Zhou, BS^{1,2}, Jingkai Huang, BS^{1,2}, Fuyan Wang, MD³, Christopher Chen, FRCP⁴, Zixuan Lin, PhD⁵, Xin Xu, PhD^{1,2,4*}

¹School of Public Health, the Second Affiliated Hospital of School of Medicine, Zhejiang University, Hangzhou, Zhejiang, China
²Key Laboratory of Intelligent Preventive Medicine of Zhejiang Province, Hangzhou, Zhejiang, China
³Department of Radiology, Sir Run Run Shaw Hospital, Zhejiang University School of Medicine, Hangzhou, Zhejiang, China
⁴Memory, Ageing, and Cognition Centre (MACC), Department of Pharmacology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore
⁵Key Laboratory for Biomedical Engineering of Ministry of Education, Department of Biomedical Engineering, College of Biomedical Engineering & Instrument Science, Zhejiang University, Hangzhou, Zhejiang, China

Key Message: In this community-based study, greater adiposity was linked to lower cerebral oxygen metabolism in aging, especially after age 70. CMRO₂ may partly explain the association between obesity and medial temporal atrophy. Long-term high BMI was also associated with reduced CMRO₂ and altered hypothalamic and temporal lobe volumes, suggesting that cumulative metabolic stress may contribute to obesity-related brain aging.

INTRODUCTION	METHODS	RESULTS	CONCLUSIONS
• Later-life obesity, especially abdominal obesity, is associated with brain atrophy and white matter damage. • CMRO₂ reflects cerebral oxygen metabolism and may detect early brain aging before structural damage occurs. • Obesity may reduce CMRO₂ through impaired perfusion, inflammation, oxidative stress, and neurovascular dysfunction. • This study examines whether lifelong adiposity trajectories are linked to lower CMRO₂ and regional brain changes in aging.	• Body shape was assessed using BMI, waist circumference, and Body Roundness Index; historical BMI at ages 25, 40, and 60 was retrospectively estimated. • CMRO₂ was measured noninvasively using TRUST and phase-contrast MRI, combined with cerebral blood flow and venous oxygenation. • Cross-sectional models examined associations between body shape, CMRO₂, and MTA, adjusting for demographic and cardiometabolic factors. • Longitudinal BMI trajectories were identified using group-based trajectory modeling, and their associations with CMRO₂ and metabolism-related brain regions were analyzed.	Cross-sectional study Stratified Analysis: Above 70 years old	• Higher BMI and BRI were associated with lower CMRO₂, especially after age 70. • Obesity-related CMRO₂ reduction may reflect lower cerebral blood flow, insulin resistance, inflammation, and cerebrovascular dysfunction. • CMRO₂ partially mediated the link between late-life adiposity and medial temporal atrophy. • Long-term higher BMI was linked to lower CMRO₂ and larger hypothalamic and middle temporal volumes. Contact: yanyifan@zju.edu.cn ALZHEIMER'S ASSOCIATION AAIC>26