Racial/Ethnic Variations in the Relation Between Body Mass Index and Cognitive Function Among Older Adults

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Objectives: *The present study examines racial/ethnic variations in the relation between body mass index (BMI) and cognitive function among older adults.* **Design:** *Cross-sectional study of secondary data.* **Setting:** *Data were obtained from the 2010 Health and Retirement Study.* **Participants:** *Racial/ethnic groups analyzed were black (n=546), Hispanic (n=110), and non-Hispanic white (n=4,104).* **Measurements:** *BMI was calculated based on self-reported height and weight. Cognitive function was measured based on Telephone Interview for Cognitive Status-Health and Retirement Study version scores.* **Results:** *Significant main effects were found for both BMI and race/ethnicity, indicating that cognitive function varies significantly by both. The BMI × race/ethnicity interaction was also found to be significant. The interaction revealed that among the white sample cognitive function scores tended to increase as BMI increased whereas the opposite relation was observed in the Hispanic sample. The black sample displayed a similar pattern as the white sample, although a decrease was observed in cognitive function scores once BMI reached obesity.* **Conclusion:** *The results suggest that the relation between BMI and cognitive function does vary by race ethnicity. Therefore, it can be concluded that high or low BMI may vary as a risk or protective factor for cognitive dysfunction among older adults by race/ethnicity. Implications for research and clinical work are discussed.* (Am J Geriatr Psychiatry 2013; ■:■−■)

Key Words: Cognitive function, body mass index, weight, racial/ethnic differences

The overweight/obesity epidemic and the aging of the population are two issues that have dominated the public health arena in recent years. Continued research has broadened the scope of our understanding of these conditions, including their implications, complications, and underlying processes. As a result of this broadening, the paths of the researchers seeking to understand these two phenomena have crossed. For example, according to the U.S. Centers for Disease Control and Prevention, adults 60 years and older are at significantly higher risk for obesity than younger adults; nearly 40% of older adults in the United States were obese in 2009−2010.[1] Most recently, the paths of aging and obesity research have converged on the topic of their respective influences on cognitive functioning. The emerging picture of the relationship between overweight/obesity, aging, and cognition is

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becoming more complex as evidence mounts, and appears to involve independent effects, as well as reciprocal, time-contingent interactions.

The relationships that have been found among body mass index (BMI) and cognitive functioning in the elderly are varying, convoluted, and sometimes contradictory. Many studies have documented the links between obesity and cognitive deficits. Cardiovascular disease and diabetes have both been found to have a detrimental effect on cognitive function and both commonly result from obesity.[2–5] Beyond this, however, several studies have demonstrated that some cognitive impairment can be attributed to adiposity per se.[6–9] The executive functioning, memory, attention, and processing speed deficits seen in obese adults compared with their normal-weight counterparts[8–10] are believed to be the results of neurophysiological changes that occur in the presence of adiposity.[3,4,11,12] Excess cytokines produced by fat cells in the body have been implicated in patterns of global brain atrophy, regional reductions in gray matter density, metabolic changes in the prefrontal regions of the brain (which are associated with memory and executive function deficits), and declines in white matter integrity (which may exacerbate normal age-related cognitive declines[11]). Cytokines have also been shown to predict white matter hyperintensity[13] and to damage the structural integrity of the blood–brain barrier resulting in fatty tissue compounds being able to cross the barrier; this can lead to dysregulation in the hippocampus and hypothalamus, eventually resulting in dementia.[13]

Research examining obesity and cognitive function with the addition of age as a factor has yielded mixed results. The detrimental effects of mid-life obesity, lifelong obesity, and significant weight gain over time on late-life cognitive functioning have been demonstrated,[7,15] but literature regarding the relationship of late-life BMI to cognitive health/decline appears contradictory. Some have suggested an inversed U-shaped association of BMI with cognitive functioning in older adults in which cognitive declines are associated with both very low and very high BMI.[16] Significant weight loss often precedes the onset of Alzheimer disease (AD),[17] and accordingly, drops in BMI in older adults are strongly associated with cognitive impairment.[16,18] The literature is contradictory with regards to higher BMI in older adults. Some consider it protective against the risk of cognitive decline[19,20] especially in older adults (those 76 years or older).[16] Others consider higher BMI or obesity/overweight in older adults to be a risk factor for cognitive dysfunction itself,[6,21] and conclusions vary by sex and age group (e.g., age 55+ versus 65+ versus 75+).[16]

Convoluted as the BMI-aging-cognition relationship is, racial/ethnic differences are likely to make these associations even more complex, and have yet to be studied extensively. Racial/ethnic disparities in cognitive health and decline associated with aging have been well documented, and span the entire range of cognitive functioning (for cognitively healthy older adults,[22] with regards to mild cognitive impairment,[23] and dementia and AD).[24] Although some research implicates flawed measurement techniques as the main source of apparent racial/ethnic disparities in cognitive aging,[25] there is also much evidence pointing to other phenomena as possible sources of these differences. In almost all cases, racial/ethnic minorities are shown to be at a disadvantage to their white counterparts (e.g., see Black and Rush).[26] A large amount of research has demonstrated that the protective effects of higher levels of education and socioeconomic status against decline enjoyed by whites are lost on aging minorities[22,26–28] Conversely, Jones[25] found a stronger negative effect of low education on cognitive function for blacks as compared to whites. Racial/ethnic minorities are also more prone to have many of the cardiovascular conditions that can lead to cognitive decline.[23,29] Furthermore, racial/ethnic minority status has been shown to mediate the relationship between such conditions and cognitive impairment[29–31] and between brain structure/physiology and cognitive impairment,[23,32] so that negative effects are amplified for racial/ethnic minorities. Additional research has found that racial/ethnic discrepancies in neuropsychological assessment scores could not be eliminated even by matching blacks and whites on years of education, and accounting for the effects of occupation and history of relevant health conditions.[24]

Limited research on the BMI-cognition-aging relationship that has been conducted on diverse samples has yielded interesting racial/ethnic differences. For example, in the 32-year Honolulu-Asia Aging Study, Japanese American men diagnosed with dementia displayed the typical trend of weight loss in the years