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# ACCELERATED COGNITIVE AGING: A HYPOTHESIS TO ACCOUNT FOR RACIAL DIFFERENCES

Keith E. Whitfield, Department of Biobehavioral Health, The Pennsylvania State University

## Introduction

Individual variation in cognitive aging is well documented from both cross-sectional and longitudinal research (e.g., Hertzog & Schaie, 1988; Horn, 1982; Schaie, 1983; Schaie, 1989; Schaie, 1990; Schaie & Hertzog, 1983, 1986; Willis, 1991). Conventional wisdom suggests that decline in cognitive functioning is a prevalent and pervasive aspect of the course of normal aging for all older adults. Cross-sectional research has provided data on normative levels of functioning for populations by gender, age, and even race for some cognitive assessments (e.g., Fillenbaum, Heyman, Huber, Ganguli, & Unverzagt, 2001; O'Bryant, Hilsabeck, McCaffrey, & Drew-Gouvier, 2003). These studies cannot, however, address the issue of positive and negative trajectories and the determinants for such paths in the process involved in and associated with aging. Longitudinal studies provide the ability to identify factors that are involved in the progression of cognitive processes during aging. This type of research design is needed to identify accurate patterns of the course of cognitive aging and mediating and moderating factors that cause diversions from the 'normal course' of cognitive aging. Implicit in this type of research is the presence of identifiable risk factors that contribute to changes in the trajectory of change in cognitive processes. Proposed here is the concept of accelerated cognitive aging, defined as the premature and rapid (compared to age norms) decline of normal cognitive functioning to a state of impaired functioning. Accelerated cognitive aging is hypothesized to appear from an individual's pattern of one or more risk factors that involve health indices and disease processes, demographic factors and characteristics related to ability, and to vary across racial/ethnic groups.

Longitudinal investigations of cognitive abilities have illustrated that very few individuals show decline on all abilities (Schaie, 1989). Furthermore, different patterns and sources of individual variation in cognitive aging are produced from differential life experiences, personality factors, chronic illnesses, and poor health. There is compelling evidence that suggests African Americans experience differential exposure to chronic stressors, have higher rates for many chronic illnesses and self-reports of poor health, and have different life experiences as compared to Caucasians (Whitfield, Weidner, Clark, & Anderson, 2002). It is these same risk factors that contribute to accelerated trajectories of cognitive aging. Many of these same conditions are the focus of the health disparities reduction initiative launched by the National Institutes of Health. Research on cognitive aging, however, has only begun

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to explore the relationship between these factors and cognitive functioning in African Americans. While there is no single study that demonstrates support for this hypothesis, there is support in the literature reviewed below that this hypothesis is accurate. Due to the differences between African Americans and Caucasians in physical health, demographic, and social factors, African Americans would be expected to decline in cognitive functioning as they age faster than Caucasians.

### **Health and Cognitive Functioning**

Previous research suggests that health is an important mediator in adult intellectual functioning (e.g., Barrett & Watkins, 1986; Elias, Elias, & Elias, 1990; Perlmutter & Nyquist, 1990; Schaie, 1994). It has been proposed that fluid abilities (spatial orientation and inductive reasoning) are affected by experiential determinants and other influences that directly influence physiological processes and structures on which intellectual development is based (see Horn & Donaldson, 1980).

Health problems show negative influence on cognitive functioning and are more prevalent in the elderly (e.g., Perlmutter et al., 1988). There is a considerable body of research on the relationship between self-rated health and cognition (e.g., Field, Schaie, & Leino, 1988; Hultsch, Hammer, & Small, 1993; Perlmutter et al., 1988; Perlmutter & Nyquist, 1990; Salthouse, Kausler, & Sauls, 1990). For example, Perlmutter and Nyquist (1990) found that self-reported health accounted for a significant proportion of the variance in cognitive performance on tasks such as digit span and measures of fluid intelligence, even after age-related differences in health were statistically controlled. Whitfield and colleagues (1997) used data from the MacArthur Study of Successful Aging to conduct a longitudinal examination of the influence of physical health, psychological, social, and mental health on individual differences in cognition among African Americans. They examined relationships between self-ratings of health as well as cumulative chronic illnesses, peak expiratory volume, number of strenuous activities, and smoking. Details of the selection criteria for the MacArthur Studies of Successful Aging can be found elsewhere (Seeman et al., 1994). Briefly, subjects were subsampled from three larger, community-based studies of individuals aged 65 years and older on the basis of age and physical and cognitive function at the time of their 1988 interviews for these larger studies. The age restriction (70-79) was imposed to minimize age as a factor in subsequent analyses, such as longitudinal monitoring of factors associated with the maintenance of better health and functioning. Age-eligible men and women (n=4030) were screened on the basis of six criteria to identify a relatively high functioning cohort (i.e., approximately the top third of the age group in terms of physical and cognitive function; see Seeman et al., 1994 for criteria). Of the 1313 subjects who met criteria and agreed to participate, 224 were African-American (89 men and 135 women). The results indicated that greater peak expiratory volume was related to greater cognitive performance at initial testing and when retested three years later, and was

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a predictor of cognitive abilities. Current self-rated health was an important predictor of improvement or maintenance of cognition, and retrospective dimensions of self-rated health were predictive of decline. We propose that counts of chronic illnesses would have an effect if this were not such a healthy sample overall.

One chronic disease that appears to play a central role in lower cognitive functioning is hypertension. Much of the research on associations between cognition and hypertension has focused on neuropsychological assessments of cognition (e.g., Elias & Elias, 1993; Elias, D'Agostino, Elias, & Wolf, 1995; Elias & Robbins, 1991; Elias, Robbins, Schultz, & Pierce, 1990; Elias, Wolf, D'Agostino, Cobb, & White, 1993. For a review see Waldstein, 1995). This comprehensive body of research suggests that high blood pressure levels are inversely related to cognitive functioning. This relationship is quite apparent when normotensives are compared to hypertensives.

Other research indicates that increases in blood pressure and chronicity of hypertension are associated with lower levels of cognitive performance on several measures, particularly those assessing memory (Elias et al., 1995). Another study identifies mid life systolic blood pressure to be highly predictive of late life cognitive function (Launer, Masaki, Petrovitch, Foley, & Havlik, 1995). The subjects were 3735 Japanese-American men, surviving members of the prospective Honolulu Heart Program living in Hawaii in the community or in institutions, with an average age of 78 years at the fourth examination. In this study, for every 10 point increase in mid life systolic blood pressure there was a 7% increase in risk for intermediate cognitive impairment and a 9% increase in risk for poor cognitive function. Adjustments for stroke, coronary heart disease, and subclinical atherosclerosis reduced the strength of the relationship between mid life systolic blood pressure and poor cognitive function to 5%. The majority of the literature on hypertension and cognitive impairment has not included African Americans. The relative importance of an identifiable association between hypertension and cognitive decline in African Americans can be illustrated by differential rates of cognitive impairment in African Americans as compared to Caucasians. For example, in a large epidemiological study involving 2407 African Americans and 1438 Caucasians over 60 yrs of age, African Americans 71 to 80 years of age showed mild cognitive impairment at twice the rate in whites. Rates of moderate to severe impairment at ages 76 to 85+ were nearly 3 times higher in African Americans (Callahan, Hendrie, & Tierney, 1995).

Given the greater prevalence, severity, and earlier onset of hypertension in African Americans and because it is a predisposing factor for several conditions (e.g., cardiovascular disease and stroke) that frequently lead to mortality, cognitive declines associated with hypertension would be expected and may be related to the higher rates of premature mortality observed in this population. There are a number of studies on the relationship between mortality and cognitive performance. These

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studies suggest that lower cognitive performance is an important predictor of mortality in older adults (Bank & Jarvik, 1978; Eisdorfer & Wilkie, 1973; Deeg, Hofman, & van Zonneveld, 1990; Evans, Smith, & Scherr, 1991; Jarvik, Kallman, & Falek, 1957; Jarvik & Falek, 1963; Liu, LaCroix, & White, 1990; Snowden, Oswald, & Kane, 1989; Swan, Carmelli, & LaRue, 1995). A second rationale for examining possible associations between hypertension and cognitive performance among African Americans is the growing evidence of low availability and utilization of health care by African Americans as well as previous findings of high chronic illness rates (hypertension, diabetes mellitus, and coronary heart disease) in this population (Ferraro & Farmer, 1996; Harper & Alexander, 1990; Marquis & Long, 1996; Miles & Bernard, 1992). These conditions may be principal contributors to increased susceptibility to the development of vascular dementia (Folstein, Anthony, & Parhad, 1985) and hypothesized accelerated age-normative declines in cognition among African Americans (Whitfield & Willis, 1998).

### **Education**

Perhaps one of the best known sources of individual differences in cognition among older adults is education (Adams-Price, 1993; Harper & Alexander, 1990). African Americans have an important history-graded influence that may impact the relative contribution of education to cognitive functioning. The Brown vs. the Board of Education ruling in 1954 established desegregated schools in three cities: New York, Washington and Baltimore. The idea was to equalize educational opportunity for Caucasians and African Americans. If this were the impact on education for African Americans then there should be a difference in cognitive aging between those who attended desegregated and segregated schools. To examine the potential influence of quality of education on cognitive aging among African Americans, Whitfield and Wiggins (2003) used one of the most common conceptualizations of cognition: fluid and crystallized abilities (Horn, 1982; Horn & Cattell, 1966). Fluid abilities, measured by Spatial Orientation and Inductive Reasoning, are thought to be innate and less influenced by culture or education but vulnerable to decline with advancing age. Crystallized abilities, measured by Verbal Meanings and Numerical Concepts, are thought to be dependent on and developed from cultural influences and resistant to changes with advancing age.

In the study by Whitfield and Wiggins (2003), data was collected from 201 subjects, 40% of whom had attended segregated schools. Using measures of fluid and crystallized ability to assess cognition, researchers found that the desegregated group had significantly higher mean cognitive scores compared to the segregated group. However, after accounting for age and years of education, they found no significant mean differences between the schooling groups for either the fluid or crystallized composite dimensions. In addition, no differences were found on the specific measures of Number Concept, Inductive Reasoning, and general fluid and crystallized

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abilities, but differences existed for measures of Vocabulary and Spatial Ability. This study involved one of the first cohorts to attend desegregated schools. Any improvement in educational quality due to desegregation that might have led to better cognitive aging appears to have been diminished by other aspects of the school environment, which might include racism by students or by teachers. With this in mind, any differences based on type of school attended might only be observed in future cohorts. Perhaps a more interesting question is how these individuals fare over time. The true impact of desegregation may only be observed by examining individual trajectories. Knowing the educational starting points to understand the course of cognitive aging would significantly assist in the interpretation of the possibility of accelerated cognitive aging by African Americans, particularly given their unique life, health, and education experiences.

### **Conclusions**

Provided here is a brief conceptualization of the accelerated cognitive aging hypothesis. This hypothesis suggests that due to disparities in health, demographic, and social factors, African Americans as a group are expected to decline in cognition with age faster than Caucasians. A possible alternative explanation is that while there are mean differences between African Americans and Caucasians in cognitive functioning, this difference remains constant throughout the life course and thus African Americans do not experience differential changes in their cognitive status (as a group) relative to Caucasians.

The accelerated cognitive aging hypothesis, if supported by empirical investigations, would be an important addition to understanding the ‘collateral damage’ that is experienced by African Americans via health disparities and is yet another reason for the need to eliminate the differentials in health by race. A longitudinal examination that includes at least three time points with diverse groups of African Americans and Caucasians is needed to test this hypothesis. Three time points are important to get the dynamic nature of change in cognitive functioning with time and would allow the use of sophisticated statistical approaches such as latent growth curve modeling. Diversity in the education, health, and social characteristics of participants in the groups is needed so that the contribution of each can be properly estimated. Population based approaches offer perhaps the best opportunity to obtain a reasonable sample of the kind described. Most large survey studies do not have extensive cognitive testing that tap multiple concepts, so previous research projects are not well suited for the kind of analyses necessary for testing this hypothesis. Future efforts to create a short cognitive battery will help assess whether accelerated cognitive aging does occur for African Americans.

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Please direct all correspondence to Keith E. Whitfield, Ph.D.; Department of Biobehavioral Health; 210 E Henderson; The Pennsylvania State University; University Park, PA 16802. kew5@psu.edu.

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