Relationships Among Education, Age, and Cognitive Functioning in Older African Americans: The Impact of Desegregation

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ABSTRACT

The current study sought to examine whether there were differences in the structure of specific cognitive abilities and their association with age and education in a sample of African American elders with two different early educational experiences. The study was conducted with a sample of 197 community dwelling older adults ranging in age from 50 to 79 years (mean age = 61.50 years, SD = 7.30 years). The sample included 79 individuals who attended a desegregated school at anytime during their formal education, while 118 participants completed their schooling without ever attending a desegregated school. Major results included: (1) typical patterns among cognitive abilities and age as well as years of education were found in the full sample of participants; (2) the pattern of age differences in cognition differed between the two groups. Regarding the latter, the desegregated sample exhibited significant negative age differences for some cognitive abilities, while the segregated group did not. Discussion focuses on the importance of considering the nature of the educational experience when examining cognitive aging in African American elders.

Previous cross-sectional studies have found that older individuals who report a higher level of educational attainment perform better on measures of cognitive functioning than older adults with less education (e.g., Anstey & Christensen, 2000; Christensen & Henderson, 1991; Lindenberger & Reischies, 1999). The impact of educational attainment on later cognitive functioning is also well established in the clinical literature where the number of years of education is central to the interpretation of performance on neuropsychological measures (e.g., Le-Carret et al., 2003).

To date, most aging studies that have examined the relationship between education and cognition have used homogeneous samples consisting primarily of Caucasian and well educated older adults. Fewer studies have examined the association between cognition and education in samples of minority elders, particularly African Americans. In studies that have included African American participants, the relationship between education and cognitive functioning is similar to that reported in studies consisting of only Caucasian participants (Cagney & Lauderdale, 2002; Manly & Jacobs, 2002; Manly, Jacobs, Touradji, Small, & Stern, 2002; Zsembik & Peek, 2001).

Previous studies have assumed that “years of education” is an appropriate index of educational attainment. This assumption may be problematic, since it fails to capture individual differences in the quality of various contextual factors within the educational setting (Whitfield & Willis, 1998).
The problem becomes even greater when dealing with African American elders, since they were recipients of a number of societal pressures (e.g., racism in the classroom, separate but equal schooling, and discriminatory school funding practices) during their formative educational years. These early pressures may serve to influence the relationship between education and cognitive functioning later in life. In fact, the early educational environment within the population of African American elders may have, to an extent, varied greatly producing more heterogeneity in this population later in life.

While there are a number of potential sources of within group variability in African American elders, one such source may be whether the individual experienced the desegregation of the public school system. Given the integration of African Americans into Caucasian schools did not take place uniformly across the United States, there exists today a dichotomy in the older adult African American population where some individuals experienced some of their education in desegregated schools, while others attended only segregated schools.

Previous research has suggested that the two educational environments were indeed different. For instance, Caucasian teachers did not have as high as expectations for African American students as did teachers of the same race (Beady & Hansell, 1981; Massey, Scott, & Dornbusch, 1975). Desegregated schools were sometimes left with less qualified teaching staffs, as more qualified instructors requested to be transferred and more qualified Black teachers were removed from their positions or demoted (Bruno & Doscher, 1981). It has been suggested then that the context inside the classroom that was generated by early desegregation may have been uncertain, hostile, and stressful for African American students (Walker, 1996).

Desegregation of public schools has not been systematically studied to assess its influence on cognitive functioning in aged individuals. Given the salience of years of education in accounting for individual differences in cognitive functioning, it is reasonable to assume that differing school environments may have an impact on the magnitude and pattern of age differences in cognitive functioning observed in the later portion of the lifespan. In addition to age, the typical “years of education” index may relate to cognitive functioning to a varying degree in the two educational groups. The current study represents a preliminary attempt to identify a starting point for identifying within group variation (Whitfield, 1996). However, further research is needed to determine the specific and unique influences that are encompassed by the overarching label of desegregation.

The current study examined two questions in an attempt to more closely examine within group differences. First, to what extent is education and age associated with a broad battery of cognitive abilities in a sample of older African Americans? Given the findings from previous studies, it was expected that in the full sample of participants, cognitive functioning would be negatively associated with age and positively associated with educational attainment. Second, does the relationship between age and cognition as well as age and years of education differ in the two educational groups? If the contextual milieu in which an individual’s education took place is an important influence on the development of cognitive functioning, then it is expected that such differing contexts as attending a desegregated or segregated school will have an influence on later cognitive functioning.

**METHODS**

**Participants**

Our study sample consisted of 197 independently living, community dwelling African American elders (females = 125; males = 72) ranging in age from 50 to 79 years (mean = 61.50, SD = 7.30). These elders participated in the Baltimore Study of Black Aging (BSBA), which was designed to examine, cognition, health, and personality in older African Americans and consists of several substudies. In the full sample of participants, the average monthly income was 952 dollars and the average years of education was 12 years (range = 3–20, SD = 2.76).

This sample contained two subgroups of older adults, those individuals who attended only a segregated school (N = 118) and a group who attended a desegregated school (N = 79). Adjusting for family-wise error (p < .01), the two educational subsamples
differed significantly with respect to age and years of education, with the segregated group being slightly older and reporting fewer years of education than the desegregated group (see Table 1). The proportion of males and females in the segregated and desegregated groups were statistically equivalent, and both educational groups were statistically similar on the self-reported health variables. Incidence of diabetes, hypertension, cardiovascular disease, and stroke as assessed by a self-report measure were also statistically similar in the two subsamples.

**Measures**

The current investigation contained a number of psychometric measures of cognitive functioning, which assessed the abilities of inductive reasoning, verbal meaning, processing speed, declarative memory, and everyday memory. Given that the measures are outlined in detail elsewhere (Whitfield & Wiggins, 2003) only a brief description is provided. Inductive reasoning, which is defined as the ability to reduce novel relationships in overlearned material (i.e., letters and numbers), was assessed with the Letter Series Test (Thurstone, 1962), the Number Series Test (Thurstone, 1962) and the Shipley Institute of Living Scale Abstraction Test (Shipley, 1986). Measures of Verbal ability (recognition vocabulary skills) indexing participants’ basic knowledgeability included ETS Vocabulary V2 Tests (Ekstrom, French, Harman, & Derman, 1976) and Verbal Meaning Test (Thurstone, 1962) and the Shipley Institute of Living Verbal Meaning Test (Shipley, 1986).

Processing speed can be defined as the speed of which mental operations are conducted. In the current study it was assessed by the Identical Pictures Test (Ekstrom et al., 1976) and the Number Comparison Test (Ekstrom et al., 1976). Declarative memory, which is broadly defined as the episodic memory ability to remember information previously encoded, was assessed using the Immediate Verbal Recall Test (Zelinski, Gilewski, & Schaie, 1993) and the Delayed Verbal Recall Test (Zelinski et al., 1993). Everyday Memory was assed by the ECB Declarative Memory Test (Allaire & Marsiske, 1999), which is 30-item test designed to assess memory for information presented in real-world stimuli (e.g., medication labels, checking account statement) from three functional domains (i.e., Medication Use, Financial Management, and Food Preparation/Nutrition).

Participants were asked to report if they had ever attended a desegregated school at any point during their education. Those participants that reported they had, were assigned to the desegregated group (N = 79), and those participants who reported completing their education solely in a segregated school were assigned to the segregated school group (N = 118). Education was recorded as the number of completed years in school.

**Procedure**

Individual interviews were held at a location where the participant felt comfortable and which was quiet, typically the subject’s home. Participants were not formally screened for dementia during recruitment. However, performance on the Short Portable Mental Status Questionnaire (SPMSQ; Pfeiffer, 1975), a brief measure of cognitive status, was extremely high with 86% of the sample missing no more than a single item on the measure. Testing sessions lasted approximately 3 hr with two scheduled 15-min breaks. Tests were administered in a paper-and-pencil format and under standard timed conditions.

**RESULTS**

**Correlational Relationships**

The relationships between the cognitive measures, age, and education for the full sample are presented in Table 2. Significant negative age differences were found for the measures assessing inductive reasoning, memory, and processing.
speed. The measures of verbal ability were not significantly related to age. Though all three subtests of the ECB Declarative Memory test were negatively related to age, only the ECB Medicine test exhibited significant age differences. Turning to the correlational relationships with educational attainment, higher levels of performance on all of the cognitive measures was significantly associated with greater educational attainment.

### Age Differences in Cognitive Functioning

In order to examine the relationship between age and cognition as well as years of education and cognition separately in the segregated and desegregated samples it must be established that the measures are assessing the same underlying constructs they were intended in both of the groups under investigation, a condition referred to as factorial invariance (Meredith, 1993). Analyses began by first estimating a hypothesized cognitive 5-factor model in both the desegregated and segregated subsamples. This model contained intercorrelated factors representing the five underlying basic abilities assessed by the study’s cognitive battery (i.e., Inductive Reasoning, Memory, Processing Speed, Knowledge, and Everyday Memory). Following the approach outlined by McArdle and Nesselroade (1994), a series of nested two-group models with increasing parameter equality constraints between the two groups were estimated. The fit of the first model, where no equality constraints were imposed across the two groups, produced an adequate fit to the data \( \chi^2(110, N = 197) = 125.53, p > .05; GFI = .92, RMSEA = .03 \). Next, the factor loadings for each of the measures were fixed to equality across groups, but this did not decrease the fit of the model, \( \Delta \chi^2(8) = 7.63, p > .05 \), indicating that the factor loadings were equal in the two groups. Next, an additional constraint was added by setting the errors of the indicators to equality and the fit of this model did not significantly differ from the previous model, \( \Delta \chi^2(13) = 12.45, p > .05 \), indicating that the errors, in addition to the loadings, were equal in the two groups. Finally, the constraint that the variances and covariances be equal in the two groups was added, and this did not significantly worsen model fit \( \Delta \chi^2(15) = 10.32, p > .05 \); thereby indicating that the variances and covariances of the factors were statistically equal in the two groups.

Analyses next focused on determining if the two educational groups differed with respect to age and educational differences in cognitive functioning. Using the simultaneous two-group approach, predictive paths from age and education to each of the cognitive factors (i.e., Inductive Reasoning, Memory, Processing Speed, Knowledge, and Everyday Memory) were estimated. It is important to note here that the effects of age and education on the cognitive factors were estimated simultaneously; therefore, the observed relationships between age and the cognitive factors within each group is the unique effect of age controlling for individual differences in years of education and vice versa. The two predictors (i.e., age and education) were allowed to intercorrelate, as were the five cognitive factors.

The regression parameters for age and education in predicting the cognitive factors are provided separately for each group in Figure 1. For the desegregated sample, age was negatively and significantly associated with Inductive Reasoning...
Interestingly in the segregated sample, significant age differences for Inductive Reasoning and Processing Speed were not evident. The opposite pattern was observed for the Memory factor, with negative age differences observed in the segregated group ($B = -0.19$) and essentially no age differences in the desegregated sample ($B = 0.01$). It is important to note that though they differ substantially in magnitude, the regression weights did not significantly differ between the two groups. No age differences were found for the Knowledge factor in the desegregated or the segregated groups; however, there was a trend towards positive age differences in the segregated subsamples ($B = 0.10$).

Years of education was significantly and positively related to all of the cognitive factors in the segregated group, with regression estimates ranging from $0.38$ to $0.55$. In the desegregated group, a different pattern of results were found. Specifically, years of education was not significantly related to the Processing Speed and Memory factors. The remaining three factors (e.g., Inductive Reasoning, Everyday Memory, and Knowledge) were significantly and positively associated with years of education, with parameter estimates ranging from $0.27$ to $0.53$.

DISCUSSION

The results from this investigation speak to the importance of considering within group sources of variation and provide preliminary support that the early experience of educational desegregation may be an important source of variation of African American elders’ cognitive functioning. Similar to previous investigations, this study found that in the full sample of participants, years of education and chronological age were both significantly related to cognitive functioning. Analysis examining cognition within the segregated and desegregated education groups provided two interesting results. First, the pattern of association between age and the cognitive abilities varied between the two educational groups. Specifically, age was significantly and negatively associated with the cognitive ability factors in the desegregated sample. These cognitive ability factors which represent Inductive Reasoning and Processing Speed were however, not significant in the segregated sample. Interestingly, a significant and negative association between age and Memory was found for the segregated sample and not for the desegregated sample. Second, the findings suggest that the association between years of education and cognition is not uniform across the desegregated and segregated samples.

The findings of the current study stress the importance of considering contextual factors unique to African American elders, such as educational desegregation, when studying any relationship commonly found in the general population. If this early educational experience had not been taken into account, the results from the bivariate analysis using the full sample would have provided findings pertaining to age differences in cognitive functioning similar to previous studies not only in African Americans but in Caucasians as well. By treating this sample as unique and as such taking into account one of many potential sources for its uniqueness, a differential pattern of aging was uncovered.

The question now arises as to why typical age differences in cognitive functioning were not observed in the segregated sample of African Americans. One possibility could be that these individuals actually faced less racism in their
early childhood, given the fact that they did not have to go through the experience of integration. Indeed, the stress that accompanies racism has been hypothesized to have a detrimental effect on the later health of African Americans (Clark, Anderson, Clark, & Williams, 1999). Therefore, they may have experienced less stress and therefore better health over the course of their lifespan, which in turn may have diminished age differences in cognitive performance. Future research must include more objective markers of health (i.e., blood pressure) than the subjective reports that were included in the current study as well as detailed information regarding medication use and compliance. Another possible explanation is that the dichotomy in educational settings represents differences in the actual quality of education. For instance, children in segregated schools may have received better schooling than children who attended, for the most part, newly desegregated schools. In concrete terms, the older African Americans in this study are members of the cohort for whom integration of the public school system first took place. While the social and educational benefits of ethnically heterogeneous classrooms are not debated here, the results of this study seem to indicate that the early experience of desegregation may have had a long term impact.

There are a number of caveats that one must take into consideration when considering the conclusions and interpretations from this study. First and most importantly, the study is unable to make statements regarding why desegregation and segregation seemed to have the effect that it did. Undoubtedly there are specific environmental factors and individual differences associated with attending a segregated as opposed to a desegregated school. Thus, our dichotomy is most likely a proxy for a constellation of factors which may influence the cognitive functioning of older African Americans, but this dichotomy reflects an important starting point for future research. Future investigations will need to explicitly examine participants’ perceptions of their schooling and experiences during desegregation to perhaps begin unraveling the various potential influences encompassed in desegregation. Second, the current investigation was unable to examine whether the timing or the duration of attending a desegregated school had an effect on age differences in cognitive functioning. Third, though a different pattern of age-differences was found, those differences were not statistically significant. While this could have been due to a relatively low sample size used in the two group modeling procedure, it still calls for replication to insure that findings are not spurious.

These limitations notwithstanding, this study provides critical insights into understanding cognitive aging not just for the study of African Americans but for the growing diverse older population. Clearly, much additional research is needed to not only replicate the study’s findings, but also to determine how segregation and desegregation had the effect that they did. However, the fundamental lesson to be learned is that it is critically important to identify within group individual difference characteristics in order to make effective comparisons between groups. This information will then allow between group studies to better capture the universal aspects of age-associated changes of cognition in later life. Consequently, this study further supports the need to study within group differences rather than focus on a finding from the population and assuming it applies to subgroups of the population (Whitfield & Baker, 1999).

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REFERENCES


