Early-life characteristics, midlife socioeconomic status, and late-life cognition: Evidence from the Wisconsin Longitudinal Study

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Extended Abstract for PAA 2016

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A growing body of research suggested that the origin of cognitive function in old age can be traced to early-life conditions (Richards & Deary, 2005). Studies have shown that higher childhood socioeconomic status (SES) was significantly associated with higher level of cognitive functioning in late life (Kaplan et al., 2001; Luo & Waite, 2005; Richards & Wadsworth, 2004; Singh-Manoux, Richards, & Marmot, 2005; Turrell et al., 2002). However, due to data limitations, only a few aspects of childhood characteristics were examined (e.g., childhood SES), and the majority of studies did not include childhood IQ, an important determinant of late-life cognition. Moreover, few studies used rigorous methods such as structural equation models to examine the mechanisms linking childhood conditions and cognitive functioning (see Singh-Manoux, Richards, & Marmot, 2005 for an exception) and most prior studies used ordinary least squares regressions, which did not take into consideration measurement errors associated with the observed variables. Our study extends the literature by examining a richer set of childhood characteristics including adolescent IQ, by assessing the direct and indirect effects of childhood conditions on late-life cognition, and by exploring whether the effects of childhood conditions on late-life cognition differ by gender.

In this study, we draw on the Wisconsin Longitudinal Study (WLS) to answer the following questions:

1) What kinds of childhood characteristics are associated with late-life cognitive function?
2) Are the effects of childhood characteristics on late-life cognitive function direct or indirect via adulthood SES?
3) Are there gender differences in the associations and pathways between childhood characteristics and late-life cognition?
Data and Methods

Data

The WLS is a longitudinal study of a random sample of men and women, mainly born in 1939, who graduated from Wisconsin high schools in 1957. Subsequent waves of data were collected from the original respondents or their parents in 1964, 1975, 1993, 2004, and 2011. We used the 2004 wave when the respondents were in their mid-60s. The analytic samples were restricted to those respondents who participated in both telephone and mail surveys and who participated in the cognitive tests (N=6,175). The WLS has unique strength for our study because it included measures of adolescent IQ and high-quality data of childhood SES.

Measures

The outcome variable is cognitive function, a latent variable. A battery of cognitive tests was used to measure the respondents’ cognitive abilities in 2004, including vocabulary similarities, letter and category fluency, immediate word recall, delayed word recall, and digit ordering.

All respondents were asked either six- or nine-item subset of the Wechsler Adult Intelligence Scale (WAIS-R) similarities items. For example, respondents were asked, “In what way are an orange and a banana alike?” and scores of 0, 1, or 2 were assigned based on WAIS-R protocol. The respondents received 2 points if they used abstract reasoning and 1 point for concrete reasoning. For letter fluency the respondent was asked to think of as many words as they can beginning with either an "L" or an "F", which were randomly selected. The category fluency test was similar and respondents were asked to name either as many foods or as many animals as possible in one minute. The scores were then grouped into intervals approximately equal to their standard deviations (Yonker, Hauser, & Freese, 2007). For immediate and delayed word recall, the interviewer read a list of ten high-frequency words and asked respondents to repeat back as many words as they can. The number of correct words respondents repeated ranged from 0 to 10. After about 12 minutes later, respondents were asked to recall as many words as they can from the original list. As for digit ordering, the respondents were asked to say the numbers back in ascending order after the interview read a series of three-digit numbers. The
interviewer added an additional digit following each correct response, up to eight digits. Scores ranged from 2 to 8.

Based on previous studies (Yonker, Hauser, & Freese, 2007), we used a single, second order factor for general cognitive functioning. All the first-order factor loadings were equal for men and women, and the second-order factor loadings were allowed to vary for men and women.

Childhood characteristics were measured by father’s education, mother’s education, and family’s household income in 1957, self-reported childhood health, sense of security (Until 18, how often did you know that there was someone to take care of you and protect you?) and adolescent IQ, which was mapped from raw Henmon-Nelson Mental Ability test scores in the Wisconsin State Testing Archive when respondents were in high school, most in junior year.

Midlife SES is measured by education, occupation status in 1993, and household income in 1993. Other covariates included self-rated health in 2004 (on a 5-point scale ranging from poor to excellent), whether the respondent has ever smoked, and whether the respondent participated in vigorous physical activity in a month.

Analytic Strategy

We used multiple-group structural equation modeling to analyze the data. We first imposed gender invariance constraints in the initial model and then relaxed the equality constraint for each path at a time and compared model improvement using BIC. A reduction of 6 in BIC was considered evidence in support of the alternative model (Warren, 2009). The best fitting model would be used for presentation of results.

Preliminary Results

Our preliminary results showed that childhood characteristics were associated with late-life cognition for both men and women. Only one childhood factor was directly associated with late-life cognition: adolescent IQ. We find that adolescent IQ had strong direct and indirect effects on cognitive function in later life for both men and women, whereas childhood socioeconomic status and sense of security had indirect effects on cognition function in later life, mediated largely by midlife education, occupation, and household income. Childhood health was not significantly associated with cognitive function directly or indirectly.
Midlife education, occupation, and household income had moderate effects on late-life cognition. Overall there were very few gender differences in the effects of childhood conditions on late-life cognition. Only two pathways were different. We found that father’s education and adolescent IQ had stronger effects on men’s educational achievement than on that of women.

Limitations

First, our data included high-school graduates in Wisconsin, a relatively advantaged group of respondents, most of whom were whites. A significant number of children from poor childhood backgrounds were not in our sample. Thus our study may have underestimated the effect of early life factors on late-life cognition. Secondly, one of the strengths of our study is that respondents were followed for 50 years, and some of the childhood indicators such as household income did not suffer from recall bias. However, we did include several retrospectively recalled variables, such as self-rated childhood health and sense of security. Future studies should continue to explore the reliability and validity of these childhood measures. Third, we assessed the effects of childhood characteristics on late-life cognition at one point in time, as time goes on and the aging process accelerates for WLS respondents, it is important to examine whether childhood factors are associated with cognitive decline and whether some adulthood experiences can act as protective factors and slow down the decline.
Reference


