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Original Article

Socioeconomic Status and Parenting Style From Childhood: Long-Term Effects on Cognitive Function in Middle and Later Adulthood

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Abstract

Objectives: This study assesses whether childhood socioeconomic status (SES) is related to cognitive function and cognitive change at mid and later life and explores the buffering effects of parenting style and adulthood SES.
Method: Data were derived from the 3 waves of the Midlife in the United States (MIDUS) study, a national survey including 7,108 participants aged from 24 to 75 years at baseline. We used multiple regression and multilevel models to investigate the associations between childhood SES, adulthood SES, and cognitive performance and change at midlife and the role of parents' affection and discipline.
Results: Low childhood SES was associated with lower cognitive function and more cognitive decline at mid and later life. Adulthood SES moderated the effect of childhood SES on cognitive function. Interactions showed that paternal discipline was positively related to cognitive function among participants with low childhood SES, and negatively related to cognitive function among participants with high childhood SES. High paternal affection was associated with less cognitive decline at mid and later life.
Discussion: The findings advance the understanding of the long-term consequences of SES and psychosocial factors in early life that can lead to optimal cognitive function in middle and old age.

Keywords: Health promotion, Multilevel models, Parenting style, Socioeconomic status

Life course theory underscores the protracted influence of early life experiences on later development (Elder, 1998; Hass, 2008; Jefferson et al., 2011). For example, lower socioeconomic status (SES) in early life has been shown to predict worse physical and mental health outcomes in later life (Chen, Miller, Kobor, & Cole, 2011; Cohen et al., 2010; Gruenewald et al., 2012; O'Rand & Hamil-Luker, 2005; Yang et al., 2017).

Low Childhood SES and Cognition in Later Life

It is also important to consider the long-term antecedents of cognitive health in later life. In general, consistent evidence has shown age-related declines in cognition, but there are wide individual differences and variations in the timing and extent of cognitive decline (Hughes, Agrigoroaei, Jeon, Bruzzese, & Lachman, 2018). The distal antecedents of individual differences in cognitive declines are still poorly understood. Low educational attainment and other markers of low SES in adulthood have been associated with poorer cognitive function in adulthood and age-related cognitive decline (Greenfield & Moorman, 2018), greater risk of dementia and Alzheimer's disease, and overall worse health (Chen et al., 2011; Cohen et al., 2010; Gruenewald et al., 2012). Indeed, socioeconomic factors play an important

role in both the level and extent of change in cognitive functioning in older adults. There is emerging evidence that differences in cognitive aging can be traced to early life conditions (Everson-Rose, Mendes de Leon, Bienias, Wilson, & Evans, 2003) and, in particular, socioeconomic conditions in early childhood. However, previous research on the effect of early adversity on changes in cognition has shown disparate findings (Barnes et al., 2012; Greenfield & Moorman, 2018; Kobayashi, 2017; Lyn & Burr, 2016; Melrose et al., 2013). Some studies have found that early life adversity is related to greater cognitive decline in adulthood (Barnes et al., 2012; Lyn & Burr, 2016). Melrose and colleagues (2013) found that low childhood SES was associated with worse late-life cognitive function, which was measured by semantic memory, episodic memory, and executive functioning, as well as increased rates of cognitive decline. In contrast, using data from 5,074 participants in the Wisconsin Longitudinal Study, Greenfield and Moorman (2018) found that childhood SES was a strong predictor of level of cognitive function, but they found no association between childhood SES and cognitive change. The present study adds to discussion on this topic by testing the relationship between childhood SES, cognitive function, and cognitive change at mid and later life in a large cohort from across the United States.

Researchers have studied resilience to understand which individual characteristics or situational circumstances can buffer or protect those facing early adversity who are at risk for poor health and cognitive outcomes. Understanding why some individuals are able to thrive despite experiencing childhood adversity, such as being low in SES, is crucial, because it can inform effective policies and programs that help more people reach their full potential (Masten, 2014; Moskowitz, 2010; Ryff et al., 2012). Resources thought to facilitate resilience in these recent formulations include upward socioeconomic mobility, such as higher adulthood SES (Morey & Segerstrom, 2015), and a stable and committed relationship with a supportive parent or a caregiver, which is the most common resilience factor in children (Helgeson & Lopez, 2010).

Resilience Factor: High Adulthood SES

Benefits for physical and psychological health in later life from higher adulthood SES have been well established. For individuals with lower childhood SES, upward mobility (higher adulthood SES) predicted better health outcomes than did stable or downward mobility (Johnson-Lawrence, Kaplan, & Galea, 2013; Luo & White, 2005; Morey & Segerstrom, 2015). Research has further indicated that cognitive reserve, found among those with higher educational attainment, can serve a protective effect for cognitive aging (Cagney & Lauderdale, 2002; Stern, 2002, 2009; Turrell et al., 2002). However, a recent review of 10 studies found little evidence that education moderates the rate of age-related cognitive decline (Lenehan, Summers, Saunders, Summers, & Vickers, 2015), although some have found those with greater cognitive reserve (e.g., higher education) show steeper decline in later life for verbal memory (Alley, Suthers, & Crimmins, 2007) and faster progression of decrements among those with dementia including Alzheimer's disease (Scarmeas, Albert, Manly, & Stern, 2006; Stern, 2012). From a life course perspective, Glymour and Manly (2008) discussed the dimensions of SES and the relevance to cognitive trajectories across the life course. They suggested that the benefits of education accumulate across life and concluded that education was the social exposure most frequently linked to cognitive aging. These findings suggest that understanding the key contributing factors to the development of cognitive function and cognitive change can help guide prevention and intervention strategies aimed towards enhancing cognitive well-being in later life.

Resilience Factor: Parenting Style

Maternal nurturance has been found to buffer the effects of low childhood SES on physical health in midlife (Chen et al., 2011). Miller and colleagues (2011) demonstrated a relationship between maternal nurturance and resilience for the health effects of childhood disadvantage. However, research establishing the extent to which parenting style may influence the association between childhood SES and cognitive function in mid and later life longitudinally has been lacking. This gap in the literature is critical given that parenting style has a great impact on children's physical, social, and mental development (Martin, Sturge-Apple, Davies, & Romero, 2017; Pinquart, 2017; Spera, 2005).

Researchers typically have identified three parenting styles based on the levels of discipline and affection displayed by parents on a regular basis and in a variety of situations: authoritarian (high discipline, low affection), permissive (low discipline, high affection), and authoritative (high discipline, high affection) (Baumrind, 1991). Previous researchers also included neglectful as a fourth parenting style, which is characterized by low discipline and low affection (Rothrauff, Cooney, & An, 2009). Based on theories of family socialization (Maccoby & Martin, 1983), parental affection and discipline are both considered critical to children's development. Children count on the environment to provide emotional security, physical safety, and well-being. Parental affection is important because it predicts a strong sense of self-worth and security, greater psychological well-being, and other positive outcomes (Coplan et al., 2002). Without adequate parental affection, children are likely to experience anxiety, insecurity, aggression, hostility, low self-esteem, and inadequacy (Chopik, Moors, & Edelstein, 2014). Lack of parental affection predicts worse mental and physical health in adulthood (Hintsanen et al., 2010; Repetti, Taylor, & Seeman, 2002). Parental discipline helps to shape responsible conformity and self-control in children. The rules and guidelines teach children about

group and societal standards for behavior (Baumrind, 1991). Over time, children's experience with rules and the consequences for breaking them help them to develop independent decision-making skills and to internalize control of their own behavior (Baumrind, 1991). Thus, a childhood marked by adequate parental affection and discipline is associated with a greater sense of security, more positive behavioral and emotional outcomes, and better adult functioning (Nevarez, Morrill, & Waldinger, 2018). In addition, a higher sense of security from childhood predicted better memory in later life (Chopik et al., 2014; Waldinger, Cohen, Schulz, & Crowell, 2015). A previous study (Ritter, 2005) indicated that an authoritative parenting style was associated with high levels of resiliency, while authoritarian and permissive parenting styles were most often associated with low resiliency in children. Using data from 278 children and their caregivers (96% mothers), Zeytinoglu, Calkins, and Leerkes (2018) found that maternal affection predicted greater child cognitive flexibility from preschool to kindergarten and from kindergarten to first grade. Less is known about the long-term effects of parenting styles, especially for fathers, on the relationship between childhood SES and cognitive function in mid and later adulthood. Lifespan development theories stress the influence of early childhood experiences well beyond adolescence (Elder, 1998). Given current efforts to explore the wide individual differences in the extent of cognitive change and enhance adult well-being in later life, the link between early parenting behavior and cognitive function and cognitive change in middle and late adulthood is worthy of examination.

Current Study

The present study examined whether childhood SES is related to cognitive function and cognitive change in middle and later life and whether childhood parenting style and adulthood SES have a buffering effect on this association. We extend the literature on this topic by testing the moderating effect of adulthood SES and parenting style on the relationship between childhood SES, cognitive function, and cognitive change in midlife. Information about these issues will have important implications for public health interventions that aim to improve educational attainment among low SES children, empowering parents with improved parental competence and confidence and enhancing cognitive well-being in later life.

It was expected that (a) low childhood SES would be associated with lower cognitive function and greater cognitive decline in adulthood; (b) high adulthood SES would moderate the effect of low childhood SES on cognitive function in mid and later life; and (c) parenting style during childhood would have long-term effects on cognitive function and change in mid and later life. Specifically, high discipline and high affection (i.e., authoritative parenting) were expected to buffer the effects of low childhood SES on cognitive level and change.

Method

Participants

The current study used the three waves of the Midlife in the United States (MIDUS) national database. The first wave MIDUS 1 (M1) was collected between 1995 and 1996 with 7,108 noninstitutionalized participants in 48 states selected via random digit phone dialing. The original participants ranged in age from 24 to 75 years (M = 46.40, SD = 13.00) and had a mean education level of 13.21 years, and women made up 48.3% of the sample. Nine years later, the second wave MIDUS 2 (M2) included data from about 75% (N = 4,963) of the respondents who participated in the first wave of the study. MIDUS 3 (M3) was conducted 9.12 years later, on average (SD = 0.53). Of the sample from M2, 76.9% of those eligible (N = 3,294) were retested at M3 (Hughes et al., 2018). As is typically found, those who participated at the second and third waves were positively selected on a number of variables compared with those who dropped out of the study (Radler & Ryff, 2010). More detailed information on the comparison of longitudinal and dropout participants from M2 to M3 are in the Supplementary Material. Table 1 presents descriptive statistics for the M2 sample. The average age of the participants was 58.69 (SD = 11.37), with 53% women. A majority of the participants (93%) were white, and more than 70% of the participants were married or cohabiting. The average education level of the participants at M2 was 14.32 years (SD = 2.62). At M3, participants ranged in age from 42 to 92 years (M = 64.30, SD = 11.20) and had a mean education level of 14.6 years (SD = 2.60). Women made up 55.3% of the sample. About 85% of the survey sample at M2 (4,206 out of 4,963 participants) and about 82% (2,693 out of 3,294 participants) of the survey sample at M3 completed the cognitive phone interview, the Brief Test of Adult Cognition by Telephone (BTACT; the psychometric properties of the BTACT are reported in Lachman, Agrigoroaei, Tun, & Weaver, 2014). The cognitive tests at M2 and M3 were conducted on average 9.32 years apart (SD = 0.45). As shown in the Supplementary Document, there are no significant demographic differences, including age, gender, education, race, marital status and health, between participants who completed the cognitive phone interview and those who did not. Monetary incentives were used to maximize participation: $20 at M1, $60 at M2 and M3. The Institutional Review Board at the University of Wisconsin approved the study and all data were deidentified before public release.

Variables

Episodic memory

The BTACT includes two measures of key aging-sensitive cognitive domains, episodic memory (EM) and executive function (EF), following exploratory and confirmatory factor analysis (Lachman, Agrigoroaei, Murphy, & Tun, 2010; Lachman et al., 2014). An EM factor was computed using

Table 1. Results of the Regression Models: Socioeconomic Status, Parenting Style, and Cognitive Level in MIDUS 2

	Model 1: EM		Model 2: EF		Model 3: EM		Model 4: EF	
Variables	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Covariates								
Constant	−0.690	0.440	0.597	0.383	−0.688	0.459	0.677*	0.401
Age	−0.016***	0.002	−0.023***	0.003	−0.016***	0.002	−0.024***	0.002
Gender	0.511***	0.045	−0.118***	0.039	0.508***	0.047	−0.128***	0.041
Marital status	−0.078	0.056	0.062	0.048	−0.087	0.058	0.078	0.035
Race	−0.024**	0.083	−0.389***	0.067	−0.024**	0.083	−0.389***	0.067
Childhood finance	0.009	0.020	−0.014	0.018	0.024	0.022	−0.007	0.019
Adulthood finance	−0.016	0.014	−0.010	0.012	−0.023	0.015	−0.015	0.013
Enough money	−0.024	0.037	0.022	0.032	−0.017	0.038	0.018	0.033
Family on welfare	0.016	0.113	0.103	0.098	0.056	0.125	0.096	0.109
Household income	0.074**	0.030	0.031	0.027	0.067**	0.031	0.024	0.027
Self-reported health	0.023	0.025	0.103***	0.022	0.015	0.026	0.108***	0.022
Physical activity	0.039**	0.019	0.054***	0.017	0.035*	0.020	0.056***	0.017
Smoking	−0.063	0.046	−0.088**	0.040	−0.072	0.047	−0.072*	0.041
Socioeconomic status								
Adulthood SES	0.030***	0.010	0.102***	0.009	0.035***	0.011	0.097***	0.009
Childhood SES	0.016**	0.008	0.020***	0.007	0.015*	0.008	0.021***	0.007
Adult SES × Child SES	−0.001	0.003	−0.005**	0.002	−0.001	0.003	−0.004*	0.002
Parenting style								
Maternal affection					−0.015	0.039	−0.050	0.034
Paternal affection					−0.042	0.034	−0.030	0.029
Maternal discipline					0.082*	0.043	−0.001	0.038
Paternal discipline					−0.017	0.036	−0.070	0.032
Maternal affection × Child SES					−0.001	0.012	0.011	0.010
Maternal discipline × Child SES					−0.013	0.012	0.001	0.011
Paternal affection × Child SES					0.005	0.010	−0.002	0.009
Paternal discipline × Child SES					−0.022	0.011	−0.019**	0.009
Maternal affection × discipline					0.062	0.049	0.043	0.043
Paternal affection × discipline					−0.049	0.039	−0.046	0.034
R^2	0.17		0.38		0.16		0.36	

Note. EF, executive function; EM, episodic memory; MIDUS, Midlife in the United States; SE, standard error; SES, socioeconomic status.
*$p < .1$. **$p < .05$. ***$p < .01$.

the immediate and delayed word recall. The EM factor score was computed as a standardized mean of the *z*-scored measures loading on the factor.

Executive function

EF was computed using working memory (measured by backward digit span), verbal fluency (measured by category fluency), reasoning (measured by number series completion), executive functioning (measured by task-switching [Stop and Go Switch Task, SGST]), and speed of processing (measured by 30-Seconds and Counting Task, or 30-SACT). An EF composite score was computed following exploratory and confirmatory factor analysis (Lachman et al., 2010). The EF factor score was computed as a standardized mean of the *z*-scored measures loading on the factor. For the longitudinal data set, the factor scores at M3 were standardized using the means and standard deviation from M2 to allow for examination of change.

Childhood SES

Childhood SES was indicated by the highest level of parental education (father or mother, using the available value if one was missing; operationalized as the total number of years of formal schooling, range from 6 to 20). Information on childhood SES was collected retrospectively at M1. In this database, 27.7% of the participants had a mother with a higher education level than the father.

Adulthood SES

Adulthood SES was indicated by participants' own education level operationalized as the total number of years of formal schooling, range from 6 to 20). Information on adulthood SES collected at the M2 and M3 were used in the analysis. An interaction variable was constructed from respondents' childhood SES and adulthood SES to examine social mobility, that is, the extent to which SES increased from childhood to adulthood.

Parenting style

Parenting style was measured with parental affection and discipline. Parental affection was assessed at M1 with a validated questionnaire (Rossi, 2001) which contained seven questions. The first question, "How would you rate your relationship with your mother during the years you were growing up?" was measured using a 5-point scale (1 as *excellent* and 5 as *poor*). The other six questions regarding the quality of the parental relationships during childhood were measured using a 4-point scale (1 as a *lot*, 4 as *not at all*). For example: "How much did she/he understand your problems and worries?" and "How much time and attention did she/he give you when you needed it?" Mothers and fathers were rated separately. The answers were recoded so that higher scores reflect greater levels of affection. Maternal affection and paternal affection were constructed by calculating the mean of the seven questions. Both the maternal and paternal composites showed high internal consistency (α = .91 and .92, respectively).

Parental discipline was also assessed at M1 with a validated questionnaire (Rossi, 2001), which contained four questions. For example: "How strict was she/he with her rules for you?" and "How consistent was she about the rules?" Items were recoded so that higher scores reflect higher levels of maternal discipline. Both the maternal and paternal composites showed high internal consistency (α = .77 and .83, respectively). On average, participants reported significantly higher maternal affection (M = 3.12, SD = 0.68) than paternal affection (M = 2.72, SD = 0.78, $t(4,122)$ = 34.52, p = .001). There was no significant difference between maternal discipline (M = 2.89, SD = 0.64) and paternal discipline (M = 2.91, SD = 0.76).

Covariates

Covariates were selected because of their established relationships with the independent and dependent variables in previous research. Demographic variables, which were from M2, include age (coded in years), gender (men coded as 1, women coded as 2), marital status (married coded as 1, separated, divorced, widowed and never married all coded as 0), race (Caucasian coded as 1, African American and others coded as 2), and total household income (measured using original value ranging from 0 to 300,000+ dollars per year). Financial level growing up was measured by a 7-point scale (a lot worse off than others was 1, a lot better off than others was 7), along with childhood welfare status (ever on welfare coded as 1, never on welfare coded as 2), both from M1. Current financial situation (worst possible was 0, best possible was 10) and availability of money to meet basic needs (not enough coded as 0, just enough coded as 1, more than enough coded as 2) were also examined, both from M2. Self-rated physical health, which was reported by participants on a five-point scale ranging from 1 (*poor*) to 5 (*excellent*) at M2, was also included as a covariate. Two health behavior measures were included as covariates in the analysis: smoking at M2 (ever smoked coded as 1, never smoked coded as 2) and physical activity at M2 (6-point scale ranging from 1 [*never*] to 6 [*several times a week*]). Physical activity was created by 12 questions assessing the participants' frequency of vigorous and moderate intensity separately for the summer and winter months, in three different settings (i.e., home, work, and leisure). We computed the mean score across summer and winter in all three settings for both moderate and vigorous intensity. We selected the activity intensity and setting with the maximum value to represent the highest frequency of physical activity across all intensity levels and domains (Cotter & Lachman, 2010).

Statistical Analysis

Descriptive information and correlations were computed for all study variables. Before conducting main analyses, continuous predictor variables were mean-centered for moderation analyses so that the intercepts could be interpreted as the average scores. Linear regression models were performed to examine the effect of childhood SES on cognitive function at M2. Multilevel modeling (MLM) was performed to examine the effect of childhood SES on cognitive change using the lme4 package in R (Bates, Mächler, Bolker, & Walker, 2015). Given that on average there was decline in cognition over the 9 years, a higher score indicates less decline. The positive effect indicates that higher SES was associated with less cognitive decline. All observations from M2 and the longitudinal sample at M3 (participants who had cognitive data at both M2 and M3) were included in these analyses. To examine social mobility, we created the interaction variable of parent education and own education. To examine the role of parenting style, we created the interaction variables of affection and discipline for mothers and fathers.

Before conducting the main analyses, an unconditional model was run to calculate the intraclass correlation coefficient (ICC) to determine the proportion of EF and EM variability between the two waves. In this study, the estimated ICC equals 0.669 for EF, indicating that 66.9% of the variability of change in EF was between participants and 33.1% of the variability was within participants, which was due to change during transition from Wave 2 to Wave 3. The bootstrap 95% confidence interval (CI) (Wald method) for the standard deviation of the within-individual residuals is [0.432, 0.458]. The estimated ICC is 0.480 for EM, indicating that 48.0% of the variability of change in EM was between participants and 52.0% of the variability was due to change during transition from M2 to M3. The bootstrap 95% CI for the standard deviation of the within-individual residuals is [0.755, 0.794].

We specified a multilevel model for the EM and EF factors. Denote Y_{ij} be the response for subject i (= 1,…, 4,206)

at time j (= 1, 2). The following multilevel model for Y_{ij} was specified:

$$\text{Level 1 (within-individual)}: \; Y_{ij} = \beta_{0j} + \beta_1 \text{Time}ij \; + \; r_{ij}$$

$$\text{Level 2 (between-individual)}: \beta_{0j} = \gamma_{00} + \text{u}_{0j}$$

$$\beta_{1j} = \gamma_{10} + \text{u}_{1j}$$

We also incorporated all the covariates into the model to investigate the effects of those covariates on cognitive level at M2 and cognitive change. In addition, we further examined the interactions to test whether the effects of childhood SES on cognitive function and change would be moderated by adulthood SES and parenting style. The two models tested the moderating effect of adulthood SES and parental affection and discipline on the association between childhood SES and cognitive function (EM and EF separately).

Results

Findings of Univariate and Bivariate Analyses

The descriptive statistics and correlations between Level 2 person level variables and Level 1 cognitive function factors are displayed in Supplementary Table B. Participants who were older, female, nonwhite, not married, and had lower income, education, physical health, physical activity, and childhood SES showed lower levels of EF. Participants who were older, male, nonwhite, and had lower income, education, physical health, physical activity, and childhood SES had lower levels of EM. In addition, maternal discipline was positively correlated with EM.

Findings of Regression and Multilevel Models

Main effects

As given in Table 1, participants who were older, male, nonwhite, and had lower adulthood SES, poorer physical health, and lower levels of physical activity and finances in adulthood had lower scores in EM. Participants who were older, female, nonwhite, and had lower adult SES, childhood SES, household income, physical health, and physical activity had lower scores in EF. As given in Table 2, in general, participants' EF and EM all declined as they got older. Female participants declined less in EM. Those who reported better health conditions, higher childhood SES, and fathers with high affection showed less decline in EF.

Moderating effects of adulthood SES

As given in Table 1, the interaction between adulthood SES, childhood SES, and cognition was significant for EF but not for EM. Overall, participants whose adulthood SES (own education) was higher had higher scores of EF than participants whose own education was lower, and participants whose childhood SES (parents' education levels) were higher had higher scores of EF than those whose parents' education levels were lower. To better understand the interaction effects, we interpreted them using the Johnson–Neyman (J-N) technique, which depicted the moderating effect at all values of the moderator (Johnson & Neyman, 1936). The results of the J-N technique analyses estimated that the regions of significance for the moderator, adulthood SES, were between the mean-centered value of −6.25 and 3.75 (mean-centered adulthood SES: M = 0.00, SD = 2.62), suggesting that the greatest confidence in the effects of the moderators lies inside those given values. As depicted in Figure 1, adulthood SES decreased the gap between participants in low and high childhood SES by improving EF level among participants in low childhood SES. Participants who had lower childhood SES but higher adulthood SES had EF scores that were comparable to those who had higher SES at both occasions, which was higher than the EF score of the participants who were lower in both childhood SES and adulthood SES. As given in Table 2, the interactions between adulthood SES and childhood SES were not significant for change in EF or EM, which indicated that there were no significant moderating effects of adulthood SES for cognitive change.

Moderating effects of parenting style

As given in Table 1, the interaction between paternal discipline and childhood SES was significant for EF at M2. As shown in Figure 2, paternal discipline was positively related to cognitive function among participants with low childhood SES, and negatively related to cognitive function among participants with high childhood SES. The results of the J-N technique analyses suggested that the moderating effect was significant when the mean-centered value of paternal discipline is between −0.185 and 1.23 (mean-centered paternal discipline: M = 0.00, SD = 0.78), indicating that the buffering effect of paternal discipline on the association between childhood SES and EF level at midlife was significant. As given in Table 2, the interactions between parenting style variables and cognitive change were not significant for EF or EM, which indicated that there were no significant moderating effects of parenting style for a cognitive change.

Discussion

In this study, we used a lifespan perspective to investigate the association between childhood adversity and cognitive function at mid and later life. Given the importance of understanding the early childhood factors that contribute to individual differences in cognitive aging in later life, we examined the two factors that have been identified in earlier studies to facilitate resilience for other domains of health: higher adulthood SES and parenting style (Helgeson & Lopez, 2010). The availability of the MIDUS 3 longitudinal data, using the Brief Test of Adult Cognition by Telephone (BTACT; Lachman et al., 2014), enables us to look at predictors of individual differences in changes in cognition

Table 2. Results of the Multilevel Models: Socioeconomic Status, Parenting Style, and Cognitive Change From MIDUS 2 to MIDUS 3

	Model 1: Episodic Memory		Model 2: Executive Function	
Fixed Effects	*b*	*SE*	*b*	*SE*
Time effects				
Intercept	0.328	0.322	0.864***	0.186
Age	−0.055***	0.002	−0.035***	0.001
Gender	0.060**	0.005	−0.014	0.025
Marital status	0.013	0.059	0.033	0.030
Race	−0.038	0.120	0.053	0.061
Childhood finance	−0.001	0.023	−0.015	0.011
Adulthood finance	0.026	0.016	0.003	0.008
Enough money	0.041	0.039	0.035	0.020
Family on welfare	0.029	0.060	−0.056	0.031
Household income	0.155	0.075	0.008	0.003
Self-reported health	0.053	0.028	0.001**	0.001
Physical activity	0.001	0.020	0.001	0.010
Smoking	0.069	0.048	0.070	0.024
Socioeconomic status				
Adulthood SES	0.024	0.009	−0.040	0.005
Childhood SES	0.015	0.010	0.006**	0.005
Adult SES × Child SES	0.003	0.003	0.003	0.002
Parenting style				
Maternal affection	−0.048	0.042	−0.004	0.021
Maternal discipline	−0.050	0.046	−0.023	0.023
Paternal affection	0.048	0.036	0.027**	0.018
Paternal discipline	−0.008	0.040	0.024	0.020
Maternal affection × Child SES	0.009	0.015	−0.001	0.007
Maternal discipline × Child SES	0.009	0.016	−0.005	0.008
Paternal affection × Child SES	−0.005	0.013	0.004	0.006
Paternal discipline × Child SES	−0.012	0.013	0.010	0.007
Maternal affection × Discipline	−0.055	0.052	0.009	0.026
Paternal affection × Discipline	0.023	0.042	0.003	0.001
Model fit				
−2LL (no. of parameters)	−5746.4		−3342.3	
AIC	11586.8		6778.7	
BIC	11886.4		7078.2	

Note. AIC, Akaike information criterion; BIC, Bayesian information criterion; MIDUS, Midlife in the United States; SES, socioeconomic status. Only the time effects are shown in the table.
*$p < .1$. **$p < .05$. ***$p < .01$.

during the transition into midlife and from midlife to old age in a large, U.S. national sample with a wide range of educational levels (Hughes et al., 2018). As hypothesized, lower childhood SES (measured by parents' highest education) predicted lower cognitive function. Our results added to the discussion of the sequelae of low childhood SES by showing the significant long-term consequences for cognitive change in mid and later life. Our study added evidence that childhood socioeconomic factors and early life conditions influence the nature of cognitive aging. Further, consistent with our expectations, higher adulthood SES was observed to have positive buffering effects for cognitive function in mid and later life, suggesting that upward social mobility can mitigate the effects of low childhood SES on cognitive function. The finding that the interaction between adulthood SES, childhood SES, and cognition was significant for EF but not for EM or for cognitive change is consistent with previous findings that childhood SES was a stronger predictor of individual differences in EF but not in memory. Environmental conditions—such as SES and cognitive stimulation in the home—are more robustly associated with aspects of cognition such as language, attention, and other executive functions than to memory (Greenfield & Moorman, 2018; Noble et al., 2015; Peyre et al., 2016).

In light of the attention that parenting style has received in the child development and psychology fields, the limited attention to the role of childhood parenting experiences, especially for fathers, on cognitive function in the long

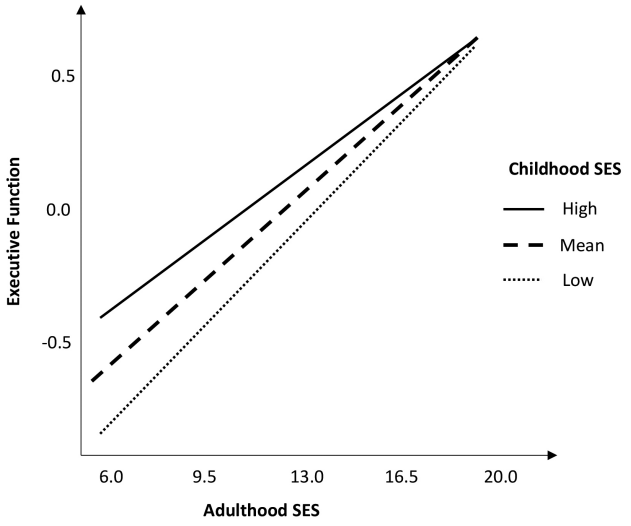

Figure 1. The relationship between childhood socioeconomic status (SES) and executive function at MIDUS 2: moderated by adulthood SES.

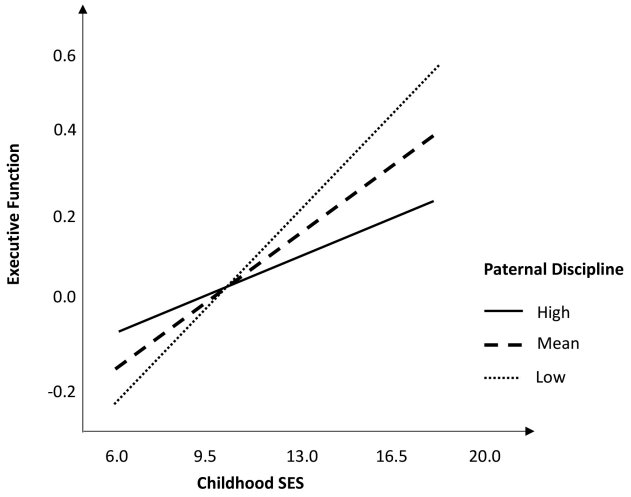

Figure 2. The relationship between childhood socioeconomic status and executive function at MIDUS 2: moderated by paternal discipline.

term is notable. Previous studies indicated that adequate parental affection and discipline could offset the educational and psychosocial disadvantages that beset children in low SES (Chopik et al., 2014; Nevarez et al., 2018; Waldinger et al., 2015). Results from the current study extend prior work by establishing a link between parenting style and cognitive function in middle age and later life. Future work can examine possible mechanisms, such as the provision of learning experiences and cognitive stimulation, whereby parenting style makes a difference for cognition. It is important to note that this association was different for mothers and fathers. Higher paternal discipline was associated with resilience in terms of lower cognitive level at midlife for those with lower childhood SES, but this result was not found for maternal discipline and maternal affection. This difference could be explained by the differences in family role expectations between fathers and mothers. The results of our study add support to previous knowledge that fathers' engagement had a significant impact on children's cognition (Cabrera, Shannon, & Tamis-LeMonda, 2007; Sethna et al., 2017) and extended it to middle age and later life. The finding that paternal discipline was positively related to cognitive function among participants with low childhood SES is consistent with the argument made by previous studies that high discipline parenting used by low income minority parents living in high-risk environments may actually benefit children's safety and development and promote school achievement (Baldwin, Baldwin, & Cole, 1990; Rothrauff et al., 2009). Using low-income samples, Finkelstein, Donenberg, and Martinovich (2001) found that African American adolescent girls whose parents used high control reported fewer depressive symptoms than Latino and White girls. Our findings provide additional support for the growing body of evidence linking father's support with children's behavior and cognitive function (Baptista, Sousa, Soares, & Martins, 2018; Cabrera et al., 2007).

The impact of low childhood SES and parenting styles extends beyond childhood and can have far-reaching consequences for individuals and their families. Most empirical studies have relied on reports of mothers' parenting styles and have ignored paternal parenting styles. The present study addresses this gap by examining both mothers' and fathers' parenting styles in relation to participants' cognitive function and cognitive change in mid and later life. In the last decade, social scientists have begun to recognize and examine the crucial role that fathers play in child development (Bronte-Tinkew et al., 2006; Nevarez et al., 2018; Schwartz & Finley, 2006). The findings point to factors that families and communities can address early on to develop interventions to reduce the negative health effects associated with low childhood SES and help individuals to thrive in the face of adversity. While research and training directly related to fathers and child cognitive development has been limited, the findings of this study have implications for research on the role of fathers in child development and the creation of programs to strengthen the capacity of fathers.

Limitations and Directions for Future Research

This study has some limitations. Race differences in the child development literature are ambiguous in terms of parenting styles and outcomes (Hart, Newell, & Olsen, 2002). Some researchers note race differences in outcomes based on parenting styles (e.g., Hart et al., 2002), whereas others report limited or no race differences (Finkelstein et al., 2001). We were limited in this investigation by a lack of racial diversity in the MIDUS sample; the vast majority of participants were non-Hispanic whites, which may have masked finer group differences, although the models did control for race. Additional research is needed to determine

the racial differences in these associations utilizing more diverse samples.

In addition, our analyses for social mobility focused on participants and their parents' education, which is a single dimension of SES and the most relevant for cognition, although financial variables were included as covariates given their known association with education. Previous studies indicated that education had the strongest direct association with cognition, whereas associations involving parental income and occupational status were statistically nonsignificant for cognition (Greenfield & Moorman, 2018; Horvat et al., 2014). Future research is still needed to determine whether upward mobility in other SES domains, such as financial mobility, might yield stronger evidence of cognitive benefits or other relevant life outcomes.

Another limitation of our study is the retrospective accounts of childhood experience and parental behavior in childhood. Potential sources of error in retrospective reports of childhood experiences include low reliability and validity of autobiographical memory (Brewin, Andrews, & Gotlib, 1993; Halverson, 1988). However, previous researchers also indicated that retrospective studies contribute valuable information (Brewin et al., 1993; Hardt & Rutter, 2004). Henry, Moffitt, Caspi, Langley, and Silva (1994) noted that retrospective measures "may constitute valid indicators of the individual's current perception of those features [of interest to social scientists], and as such, may be useful in understanding psychological development or adjustment" (p. 93). Reuben and colleagues (2016) estimated agreement between adverse childhood experiences (ACEs) prospectively recorded throughout childhood and retrospectively recalled in adulthood in the population representative Dunedin cohort (N = 1,037) and found that Dunedin and U.S. Centers for Disease Control ACE distributions were similar. Retrospective and prospective measures of adversity showed moderate agreement, which provides some evidence of the accuracy and meaningfulness of retrospective accounts of childhood experience. Nevertheless, in the present study it is not possible to confirm that the direction of effects is from childhood experiences to adult cognition. It is plausible that adult cognition has an impact on the recollections of childhood experiences. Further study is needed to rule out such alternative interpretations.

It is also important to consider that information on the participants' childhood cognitive functioning was not collected; thus, the continuity of cognitive functioning from childhood to adulthood is unclear. Other studies have found that the effects of childhood adversity on midlife cognition are mediated by childhood cognition (Richard & Wadsworth, 2004). Using longitudinal data from 1,009 male twins in the Vietnam Era Twin Study of Aging (VETSA), Beck and colleagues (2018) examined the direct and indirect paths through which childhood SES influences late midlife cognitive outcomes. Their results indicated that lower childhood SES predicts poorer cognition in late midlife primarily through young adult cognitive ability. In the present study, we examined both adulthood cognitive level and cognitive change in adulthood. The extent of change over 9 years is likely to be less dependent on earlier levels of cognitive abilities than individual differences in level of cognition in adulthood. Nevertheless, future studies would benefit from including measures of cognition from childhood or early adulthood. Another limitation is that the participants in the cognitive sample were not screened for cognitive impairment or dementia; all survey participants were included in the analysis. Although only a small percentage of participants had stroke, heart disease or other factors that might affect cognitive function, a goal for future waves of MIDUS is to screen for cognitive impairment.

Implications for Policy and Practice

Significant differences in midlife cognitive function and change were found between participants from different childhood SES backgrounds. Moreover, adulthood SES and retrospective accounts of parenting styles were also significant predictors of cognition. The findings regarding the moderating effect of adulthood SES and parenting styles on the association between childhood SES and individuals' cognitive function over time have important implications for education and family laws, policies, and practices. According to new research from the National Center for Children in Poverty (NCCP), one in every five children currently lives in a low SES family, and the number of children living in low-income households grew by 10% from 2008 to 2014 (Koball & Jiang, 2018). Many of these children struggle academically, do not complete high school, and have spotty employment as young adults (Ratcliffe & McKernan, 2010). Federal policy is needed to provide support for vulnerable populations (such as homeless and foster care children) to complete high school and have access to higher education. Those who work with low SES families, such as child welfare professionals, clinicians, educators, and medical doctors, may benefit from the additional indications that parenting styles have long-term consequences for adult cognition. It is important for professionals to be aware that fathers and mothers' parenting styles have a differential impact on children's cognitive function and cognitive change in mid and later life. Workshops and parent support groups, especially for low SES groups, that empower parents with improved parental competence and confidence may have benefits in the long run, as supportive parents can help children build key capacities including the ability to plan, monitor, and regulate behavior that enable children to respond adaptively to adversity and thrive (Hintsanen et al., 2010).

In addition, the findings have implications for understanding the early origins of cognitive functioning and cognitive change associated with aging. The pathological processes in Alzheimer's disease and dementia begin decades before the onset of clinical dementia (Sperling et al., 2011). Many physicians view mild cognitive

impairment, age-related decline in memory, and other cognitive processes as a transitional phase between normal cognitive aging and dementia, although data regarding the actual rate of crossover to dementia are inconclusive (Blieszner, Roberto, Wilcox, Barham, & Winston, 2007). Understanding the early etiology of cognitive declines in midlife (Sperling et al., 2011) may be important for improving early interventions for Alzheimer's disease and related disorders.

Supplementary Material

Supplementary data are available at *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* online.

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Author Contributions

Y. Liu and M. E. Lachman planned the study and wrote the article. Y. Liu conducted the data analysis and was supervised by M. Lachman. Both authors interpreted the research findings.

Conflict of Interest

The authors declare that they have no conflict of interest.

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