

Childhood Poverty and Late-Life Cognitive Aging: Acceleration or Delay?

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Abstract

The relationship between childhood poverty and cognitive aging in later life remains controversial. Some studies indicate that childhood poverty accelerates individual cognitive aging, whereas other research suggests it may delay cognitive aging, which is associated with the moderating role of social mobility. For individuals who experienced childhood poverty, low stability or downward socioeconomic mobility (i.e., chronic poverty) leads to cumulative negative effects of adversity, thereby accelerating cognitive aging. Conversely, childhood-poverty individuals with high psychological resilience may facilitate upward socioeconomic mobility, which increases cognitive reserve and enhances specific cognitive abilities, thereby delaying cognitive aging. Future research in this domain should examine the relationship between childhood subjective poverty and cognitive aging, as well as the effects of childhood poverty on aging across different cognitive abilities, and should also address survivor bias effects in studies investigating the relationship between childhood poverty and late-life cognitive aging.

Full Text

Childhood Poverty and Cognitive Aging: Acceleration or Delay?

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Abstract

The relationship between childhood poverty and cognitive aging remains controversial. Some studies have shown that childhood poverty accelerates cognitive aging, while others have found that it delays cognitive aging—a discrepancy

related to the moderating role of social mobility. For individuals who experienced childhood poverty, low stability or downward socioeconomic mobility (i.e., persistent poverty) leads to cumulative negative effects of adversity, thereby accelerating cognitive aging. However, psychologically resilient individuals from impoverished backgrounds may achieve upward socioeconomic mobility, which increases cognitive reserve and enhances specific cognitive abilities, ultimately delaying cognitive aging. Future research should examine the relationship between childhood subjective poverty and cognitive aging, investigate how childhood poverty affects the aging of different cognitive abilities, and address the survivor bias effect in studies on childhood poverty and late-life cognitive aging.

Keywords: socioeconomic status; poverty; cognitive aging; social mobility; cognitive reserve

Poverty represents low socioeconomic status (SES), which reflects an individual's or group's social position based on material and non-material resources (Bradley & Corwyn, 2002; Evans, 2004). SES is typically measured by parental education, parental occupation, and family income (Duncan & Magnuson, 2012; Farah, 2017). Research has shown that poverty negatively affects health, including worse immune function (Fagundes & Way, 2014), greater psychological stress (Merz et al., 2019), poorer emotion regulation (Liberzon et al., 2015), and faster social functioning decline (Steptoe & Zaninotto, 2020). Poverty also impacts cognitive abilities: children from impoverished families show lower executive function (Lawson et al., 2017), and these adverse effects persist into adulthood, with individuals from low-SES backgrounds in childhood performing worse on processing speed, attention (Horvat et al., 2014), episodic memory, and executive function (Liu & Lachman, 2019).

Generally, childhood poverty is believed to accelerate cognitive aging, a view supported by extensive research. For example, Oi and Haas (2019) found that individuals from low childhood family SES showed greater decline in general cognitive ability compared to those from high SES backgrounds. However, recent studies suggest that childhood poverty may actually slow cognitive aging. Aartsen et al. (2019) found that individuals from low childhood family SES exhibited slower decline in executive function. What, then, is the relationship between childhood poverty and cognitive aging in later life? Does it accelerate or delay decline? This controversy persists. This paper reviews relevant research and attempts to clarify the relationship between childhood poverty and cognitive aging, explaining the sources of disagreement from the perspective of social mobility.

2.1 Childhood Poverty Accelerates Cognitive Aging

Numerous studies have demonstrated that childhood poverty accelerates cognitive aging. Liu and Lachman (2019) studied individuals aged 24-75, using the highest parental education level as an indicator of childhood family SES.

Their results showed that individuals from high childhood SES backgrounds experienced less decline in central executive ability during middle and late adulthood. Zaninotto et al. (2018) used father's occupational grade at age 14 as a childhood SES indicator in an 8-year longitudinal study of individuals over 50, finding that low childhood SES accelerated processing speed decline in male participants. Melrose et al. (2013) reached similar conclusions in a multi-ethnic sample, showing that low childhood SES accelerated cognitive aging. Yang and Wang (2020) explored the relationship between early-life conditions and cognitive function, finding that favorable childhood SES protected against cognitive decline in middle-aged individuals. Research also indicates that higher childhood SES reduces the risk of cognitive impairment in old age (Zhang et al., 2008). A recent study of 9446 individuals aged 70–76 further confirmed a significant negative correlation between childhood poverty and cognitive decline, suggesting that high childhood SES facilitates entry into advantageous educational and occupational domains that provide material, cognitive, and psychosocial resources, which protect cognitive function by building cognitive reserve (Oi & Haas, 2019). Lyu and Burr (2016) conducted a 12-year longitudinal study of individuals over 65 and found that, after controlling for all covariates, individuals with more educated mothers showed less decline in general cognitive ability. This may be because educated mothers provide more cognitive stimulation and academic support, ensure better nutrition through health care practices, and promote physical health, all of which positively affect cognitive development.

2.2 Childhood Poverty Delays Cognitive Aging

While some research confirms that childhood poverty accelerates cognitive aging, other studies have found that it can delay cognitive decline. Barnes et al. (2012) examined the relationship between early-life adversity and cognitive decline in older adults, finding that among African Americans, greater childhood food scarcity was associated with less cognitive decline in old age, suggesting a protective effect of early-life adversity. Further research found that individuals from low childhood SES backgrounds showed less memory decline than those from high SES backgrounds (Zaninotto et al., 2018), possibly because childhood disadvantage increases environmental adaptability and resilience, prompting the development of effective coping strategies that slow cognitive decline. Children from impoverished backgrounds with good self-regulation can develop more effective stress-coping strategies (Blair, 2010) or enhance attentional control (Eigsti et al., 2006), reducing the negative impact of childhood poverty on adult cognition (Evans & Fuller-Rowell, 2013). Glymour et al. (2012) studied individuals over 65, testing their cognitive abilities five times over nine years, and found that individuals with more educated parents showed faster decline in verbal fluency. Aartsen et al. (2019) more recently found that individuals from high childhood SES backgrounds experienced a 1.6 times greater decline in verbal fluency test scores than those from low SES backgrounds, indicating that better childhood socioeconomic conditions were associated with greater executive function decline. Skills and strategies acquired through higher education

are vulnerable in early cognitive aging (Savage et al., 2001), and prefrontal cortex degeneration is an early feature of brain aging (Hedden & Gabrieli, 2004). This degeneration may not affect cognitive performance in less educated individuals who relied less on verbal fluency strategies early in life, whereas highly educated individuals may show deteriorating performance as these strategies become harder to use. Additionally, adverse childhood environments may enhance adults' ability to switch between tasks when facing uncertainty, possibly because growing up in unpredictable environments (where rewards and costs change rapidly) fosters switching abilities that help individuals capitalize on current rewards and avoid potential costs (Mittal et al., 2015).

3 Social Mobility Moderates the Relationship Between Childhood Poverty and Late-Life Cognitive Aging

From a life-course perspective, the socioeconomic status of individuals who experienced childhood poverty may change through downward mobility or low stability, keeping them in persistent poverty, or through upward mobility, allowing them to escape poverty.

3.1 Low Stability or Downward Socioeconomic Mobility Accelerates Cognitive Aging in Individuals from Impoverished Backgrounds

Individuals from impoverished backgrounds face greater risk of disadvantaged socioeconomic status in adulthood (Lyu & Burr, 2016) and are more likely to associate with groups experiencing persistent poverty, which reduces their belief in upward mobility and weakens motivation to escape poverty (Browman et al., 2017; Roderick, 2003; Oyserman et al., 2006; Thomas et al., 2003), resulting in lifelong low SES or continued downward mobility. Persistent disadvantage accelerates cognitive decline: older adults experiencing chronic poverty show greater memory decline (Marden et al., 2017) and perform worse on global cognitive function and verbal short-term memory tests (Haan et al., 2011) compared to those consistently in high SES positions.

Low stability or downward mobility accelerates cognitive aging in individuals from impoverished backgrounds for several reasons. First, poverty negatively affects psychological and physical health, and persistent poverty not only accumulates these adverse effects but also deprives individuals of resources to cope, causing greater cognitive damage and accelerated decline. Impoverished environments increase chronic stress (Evans & Fuller-Rowell, 2013) and promote negative parenting practices (Vrantsidis et al., 2020). Poor individuals face scarcity of material resources (Larson et al., 2015) and cognitive resources (Daneri et al., 2019), and the persistence and accumulation of disadvantage across the life course contribute to cognitive decline and increased risk of cognitive impairment (Nguyen et al., 2008). Second, childhood poverty damages brain structure, with disadvantaged ratios in hippocampal volume (McDermott et al., 2019), prefrontal cortical thickness (Lawson et al., 2013), and bilateral frontal surface area (Noble et al., 2015). Individuals in persistent poverty lack

resources to compensate for brain damage, and this damage reduces their ability to build cognitive reserve, accelerating cognitive aging. Greater frequency of income decline is associated with more damage to brain microstructural integrity and white matter volume (Grasset et al., 2019). In summary, downward mobility or low stability keeps individuals who experienced childhood poverty in persistent poverty, perpetuating harsh environments whose negative effects accumulate while resources to address damage remain scarce, thereby reducing cognitive ability and accelerating cognitive aging.

3.2 Upward Socioeconomic Mobility Delays Cognitive Aging in Individuals from Impoverished Backgrounds Although disadvantaged childhood SES has numerous negative effects, adversity also enhances the ability of individuals from impoverished backgrounds to meet challenges in uncertain environments (Ellis et al., 2017). Protective factors in adverse contexts, such as family support, can enhance psychological resilience (Bonanno et al., 2007), enabling individuals to withstand high levels of disruptive change, adjust quickly from negative experiences, and show fewer maladaptive behaviors, ultimately developing better than average (Lazarus, 1993; Masten, 2001) and achieving high SES in adulthood—that is, upward socioeconomic mobility.

Compared to individuals from high childhood SES backgrounds, advantageous adult SES may have more positive effects on cognitive health for those from impoverished backgrounds (Luo & Waite, 2005), and upward mobility may enhance their cognitive health more substantially, thereby delaying cognitive aging. Education strongly influences adult SES and encourages participation in cognitively stimulating activities that enrich environmental cognitive stimulation (Liu & Lachman, 2020) and promote repeated use of cognitive skills in daily life. Education also changes how individuals perform cognitive tasks and enhances brain plasticity, allowing individuals from impoverished backgrounds who achieve advantageous adult SES to build greater cognitive reserve. This enables them to effectively recruit neural networks and adopt optimal strategies when performing cognitive tasks during aging, showing less cognitive decline (Fratiglioni et al., 2004; Golja et al., 2020; Ihle et al., 2020; Stern, 2002; 2012).

Upward mobility not only enhances cognitive ability and offsets negative effects of early adversity on cognition (Liu & Lachman, 2019; Marden et al., 2017) but also promotes development of specific cognitive abilities that may surpass those of individuals from high childhood SES backgrounds, thereby delaying cognitive decline. Some individuals from impoverished backgrounds maintain high learning motivation despite adversity (Oyserman, 2013) and achieve academic success by leveraging limited resources (e.g., schools), increasing their educational attainment and achieving high adult SES (Browman et al., 2017). Compared to high-SES individuals, those from impoverished backgrounds may rely more heavily on working memory for academic success (Alloway & Alloway, 2010), which can lead to greater enhancement of working memory abilities that exceed those of high-SES individuals (Nweze et al., 2020), thereby delaying cognitive

aging. Overall, upward socioeconomic mobility enhances cognitive reserve and promotes better development of specific cognitive abilities in individuals from impoverished backgrounds, thus delaying their cognitive aging.

4 Future Research Directions

As reviewed above, childhood poverty can either accelerate or delay cognitive aging, with this relationship potentially moderated by social mobility. Several issues require further exploration.

First, future research should examine the relationship between childhood subjective poverty and cognitive aging. Current studies use objective childhood SES indicators, overlooking the potential role of subjective SES in cognitive decline. Research shows substantial overlap between objective and subjective poverty measures, but subjective poverty contains more dimensional information. Some family characteristics may cause individuals to underestimate household expenditures, reducing the accuracy of objective poverty measures (Posel & Rogan, 2016). Conversely, objective poverty does not fully capture subjective poverty; for example, Wang et al. (2020) found that 29% of objectively non-poor rural Chinese families subjectively felt poor. Moreover, subjective SES has better predictive validity than objective SES, as it more strongly predicts psychological stress (Sakurai et al., 2010) and physical illness (Wolf et al., 2010), both of which affect cognitive decline. Future studies should investigate whether childhood subjective and objective poverty differentially affect cognitive aging to deepen understanding of this relationship.

Second, research should explore how childhood poverty relates to aging of different cognitive abilities. Current studies focus primarily on negative effects of childhood poverty, but harsh, unpredictable environments can also promote development of specific cognitive abilities to adapt to varying contexts (Ellis & Del Giudice, 2014; Frankenhuis & de Weerth, 2013; Mittal et al., 2015). Adversity may reduce some cognitive abilities, such as working memory (Leonard et al., 2015), while enhancing others, such as procedural memory (Dang et al., 2016). Does this suggest that childhood poverty accelerates decline only in specific cognitive abilities? This implies that different cognitive abilities may have varying sensitivity to childhood poverty environments. For instance, is executive function more closely linked to childhood poverty than memory? Do different indicators of childhood family SES (income, parental education, parental occupation) relate differently to decline in different components of executive function (updating, inhibition, switching)? Future research should provide more nuanced exploration of these relationships.

Third, studies must address survivor bias in research on childhood poverty and cognitive aging. Most research examines individuals over 65 because cognitive decline becomes more apparent after this age (Korten et al., 2014; Lyu & Burr, 2016). However, individuals from impoverished backgrounds have higher mortality rates than those from high-SES backgrounds (Stringhini et al., 2017),

meaning some die before inclusion in studies. This results in samples of relatively healthier individuals or those with less severe childhood poverty. For example, in a study examining childhood poverty and cognitive aging, 43% of participants were lost to follow-up by age 65 due to death (Zhang et al., 2020). Consequently, failing to account for survivor bias may underestimate the true relationship between childhood poverty and cognitive aging. Future research should consider lifespan effects on cognitive decline, incorporate mortality risk of individuals from impoverished backgrounds into models before cognitive decline begins (e.g., before age 65) (Okamoto, 2019), and examine cognitive decline patterns in those who survive.

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