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Parents' Perceived Neighborhood Safety and Children's Cognitive Performance: Complexities by Race, Ethnicity, and Cognitive Domain

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Abstract

Background: Aim: To examine racial/ethnic variations in the effect of parents' subjective neighborhood safety on children's cognitive performance.

Methods: This cross-sectional study included 10,027 children from the Adolescent Brain Cognitive Development (ABCD) study. The exposure variable was parents' subjective neighborhood safety. The outcomes were three domains of children's cognitive performance: general cognitive performance, executive functioning, and learning/memory. We used mixed-effects regression models for data analysis.

Results: Overall, parents' subjective neighborhood safety was positively associated with children's executive functioning, but not general cognitive performance or learning/memory. Higher parents' subjective neighborhood safety had a more positive influence on the executive functioning of non-Hispanic White than Asian American children. Higher parents' subjective neighborhood safety was associated with higher general cognitive performance and learning/memory for non-White children relative to non-Hispanic White children.

Conclusion: The race/ethnicity of children moderates the association between neighborhood safety and cognitive performance. This becomes more complicated, as the patterns seem to differ across race/ethnicity and cognitive domains. It is unknown whether the observed racial/ethnic variations in the effect of neighborhood safety on cognitive performance are due to neighborhood characteristics such as residential segregation. Addressing neighborhood inequalities is needed if we wish to reduce racial/ethnic inequities in the cognitive development of children.

Keywords

race; ethnicity; population groups; children; cognition; cognitive performance

1. Introduction

There are significant racial/ethnic disparities in the cognitive performance of American children [1–3]. For example, non-Hispanic White children perform better on tests of cognitive functioning than non-Hispanic Black and Hispanic children [4]. Hispanic and Black children are at a higher risk of low academic achievement and school dropout than non-Hispanic White children [5]. Racial/ethnic disparities in cognitive functioning are likely attributable to the social and economic consequences of structural racism, social stratification, and segregation [6]. As childhood cognitive performance is the primary

predictor of future educational and economic success during adulthood, there is an emerging interest to identify the complex interactions between various social factors that drive racial/ethnic disparities in childhood cognitive function [7–10]. Identifying such social factors is necessary to design effective interventions to eliminate racial/ethnic disparities in children’s cognitive development and associated inequalities later in life [7–10].

Neighborhood conditions such as neighborhood safety [11–15] are a social determinant of children’s cognitive development, independent of socioeconomic status (SES) [16–19]. Compared to non-Hispanic Whites, racial/ethnic minorities are more likely to reside in unsafe neighborhoods un conducive for proper brain development [20]. Such unequitable neighborhood conditions are the result of America’s legacy of segregation, both de jure and de facto, which systematically denied racial/ethnic minorities the opportunities and resources needed to live in safe, resourced, and high-quality neighborhoods [21]. Children who reside in safer neighborhoods, for instance, show higher levels of cognitive outcomes [16–19]. As such, neighborhood safety may be an important mechanism that informs inequalities in children’s cognitive, behavioral, developmental, and health outcomes across racial and ethnic groups [22–24]. Unsafe neighborhoods have fewer resources to engage in stimulating learning, constructive socialization, and supportive parenting, which have lasting impacts on child development [25–27]. Moreover, children who live in safer neighborhoods attend high-quality schools and have access to enriching environments that promote cognitive functioning [28–31]. In contrast, unsafe neighborhood and school environments can undermine children’s outcomes [32–36] including cognitive development [37–41].

Although various environmental factors influence children’s cognitive development, most previous research has focused on subjective and objective aspects of SES at the family level [42]. There are neighborhood characteristics, such as neighborhood safety, however, that also contribute to racial/ethnic inequalities in child development [16–19]. Some studies suggest that racial groups may be differently impacted by neighborhood safety [43]. For example, neighborhood safety may better predict Whites’ than Blacks’ life expectancy over a 25-year follow up [43].

Measures of family SES such as parental education, household income, and family wealth have been consistently associated with children’s developmental outcomes such as cognitive performance [44]. The magnitude of these effects, however, differ across racial and ethnic groups [45]. Nevertheless, family SES reflects a partial aspect of children’s lives. To have a comprehensive understanding of children’s exposure to adversities, more research is needed on how contextual factors such as neighborhood safety influence different racial and ethnic groups. Subjective measures of neighborhood safety are a proxy of how much environmental stress families and children perceive on a daily basis. Chronic exposure to adversity such as living in unsafe neighborhoods may blunt child cognitive development. Thus, while objective measures are essential for understanding the family environment [46–48], subjective neighborhood measures are also essential to understanding child development [43].

Parents’ subjective neighborhood safety is associated with health and developmental outcomes of the child [49–51], independent of objective measures such as SES [42,46–

48,52,53]. For racially and ethnically marginalized populations, having fewer SES resources means economic distress, housing insecurity, and food scarcity, which may reduce parents' subjective neighborhood safety and increase baseline stress and fear of violence [54]. Recent research suggests that diverse groups based on race, ethnicity, and gender are differently sensitive to negative effects of low family SES [45] and subjective neighborhood safety [55]. Thus, there is a need to extend this literature to decompose the effects of objective and subjective measures of SES and neighborhood safety [56–58]. We also need more studies that test whether racial and ethnic groups differ in their sensitivity to objective and subjective evaluation of environmental safety [59].

While cognitive function is a multi-dimensional construct that reflects general cognitive functioning, executive functioning, and learning and memory, we know less about the relevance of SES, subjective neighborhood safety, and marginalization-related diminished returns (MDRs) to each cognitive domain. Very few studies have disaggregated cognitive functioning, and most of the existing knowledge on SES and cognitive function is not nuanced and granular enough at the level of cognitive domains.

Aims

To extend the existing knowledge on racial/ethnic variation in social determinants of children's cognitive outcomes in the US, we applied the MDRs theory [55], defined as weaker effects of social and economic resources on outcomes for racially and ethnically marginalized than non-Hispanic White children, to assess racial and ethnic variations in the association between parents' subjective neighborhood safety (as a social resource) and children's cognitive function, in a large national dataset. We hypothesized positive associations between parents' subjective neighborhood safety and children's cognitive function [35,60,61]. However, we expected weaker associations for non-White compared to non-Hispanic White children.

2. Methods

2.1. Design

This study is a secondary analysis of wave 1 data (2016–2018) of the Adolescent Brain Cognitive Development (ABCD) study [62–66], a landmark children's brain development study in the United States. More nuanced data on the details of the ABCD study are available elsewhere [62,67].

2.2. Sampling

In the ABCD study, participants were limited to 9–10-year-old children who were recruited from multiple cities across several states in the US. In total, 21 ABCD centers were involved in the recruitment of the children. The main recruitment strategy was through the school systems [68]. The current analysis's eligibility criteria were: having valid data on race/ethnicity, demographic factors, neighborhood safety, and cognitive performance ($n = 10,027$).

2.3. Study Variables

2.3.1. Demographic and Socioeconomic Confounds—Age, sex, parental education, household income, and parental marital status were the confounders. Parents were asked to report the age of their children. Child age was a continuous variable, measured in months. Child sex was a dichotomous variable with 1 for males and 0 for females. Household income was a three-level categorical variable: less than 50 K, 50–100 K, and 100 K+, as reported by the parent. Parental marital status was equal to 1 for married and equal to 0 for unmarried. Parental education was a categorical variable: less than high school, high school completed, some college, Bachelor’s degree, and postgraduate studies.

2.3.2. Primary Outcome

Cognitive performance. The ABCD study used multiple neurocognitive measures [66] to define three aspects of cognitive function: (1) general cognitive performance, (2) executive function, and (3) learning and memory. In all of these domains, the variable is treated as a continuous measure, and a higher score indicated higher cognitive performance. For a full description of how these domains of cognitions are generated, please see the paper by Thompson et al. [69].

2.3.3. Independent Variable

Neighborhood safety. Parents answered questions about their sense of neighborhood safety. The items were developed by Diez Roux and colleagues [70] and included: “I feel safe walking in my neighborhood, day or night”, “violence is not a problem in my neighborhood”, and “my neighborhood is safe from crime”. Responses were 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral (neither agree nor disagree)/Neutral; 4 = Agree; 5 = Strongly Agree. We calculated the mean of the three items [70]. This variable was treated as a continuous variable [70]. A higher score was higher neighborhood safety.

2.3.4. Moderator

Race. Race/ethnicity, a sociological, rather than a biological factor, was self-identified by the parents. Race/ethnicity was a categorical variable non-Hispanic White, non-Hispanic Black, Hispanic, Asian, and other race/ethnicity. Other-race included racial minority youths who are not White, Hispanic, Asian, or Black.

2.4. Data Analysis

We used the Data Analysis and Exploration Portal (DEAP) for data analysis. DEAP is specifically designed for analysis of ABCD data. Mean, standard deviation (SD), frequency, and relative frequency were reported. We performed an analysis of variance (ANOVA) and Chi-square test to test group differences in the association between race/ethnicity and our study variables. We also ruled out multi-collinearity between our study variables. Using kurtosis and skewness measures, outcomes showed normal distribution. Error terms also showed near to normal distribution. For our multivariable models, we applied mixed-effects linear regression models (Appendix A). All of our models were performed on the study sample. Our mixed-effects models adjusted for the nested nature of the data in the families. We used the propensity score to generate results that are representative of the US. As such,

our results were weighted. Our *Model 1* did not have any interaction terms. Our *Model 2*, however, included interaction terms between race/ethnicity and parents' subjective neighborhood safety. Separate models were performed for each cognitive domain: (1) general cognitive performance, (2) executive function, and (3) learning and memory. Thus, we performed a total of six regression models. From our models, we reported *b*, *SE*, and *p* values, with *p* less than 0.05 considered statistically significant.

3. Results

3.1. Descriptives

Table 1 shows that 10,027 9–10-year-old children were included in the current analysis. Of this number, 5494 (weighted percentage = 55.2%) were non-Hispanic White, followed by 1911 who were Hispanic (weighted percentage = 22.5%), 1371 who were non-Hispanic Black (weighted percentage = 12.3%), and 1046 who were Other race/ethnicity (weighted 6.6%). Only 205 children were Asian (weighted percentage = 3.5%).

Table 2 presents the fit of mixed-effects regression models in the overall sample. The inclusion of the interaction term of race/ethnicity by parents' subjective neighborhood safety (Models 2) helped explain a larger variance of the outcomes compared to Model 1, which did not include any interaction terms.

3.2. Multivariate Analysis without and with Interactions

3.2.1. General Cognitive Performance—Table 3 shows the results of two linear regression models for our first outcome in the overall (pooled) sample, in the absence and presence of the interaction terms. Model 1 (Main Effect Model) showed no effect of high parents' subjective neighborhood safety on general cognitive performance. Model 2 (Interaction Model) showed a statistically significant interaction effect between race/ethnicity and parents' subjective neighborhood safety on general cognitive performance, suggesting that the effect of high parents' subjective neighborhood safety on general cognitive performance is larger for the Other race/ethnicity group compared with non-Hispanic White children (Table 3).

Figure 1a shows no main effect of parents' subjective neighborhood safety on general cognitive performance. Figure 1b shows that the effect of parents' subjective neighborhood safety on general cognitive performance was larger for children in the Other race/ethnic category than non-Hispanic White children.

3.2.2. Executive Functioning—In Table 4, there are two linear regression models that report the association of interest in the overall (pooled) sample in the absence and presence of the interaction terms. Model 1 (Main Effect Model) showed a boosting effect of high parents' subjective neighborhood safety on executive functioning. Model 2 (Interaction Model) showed a statistically significant interaction between the effects of race/ethnicity and parents' subjective neighborhood safety on executive functioning, suggesting that the boosting effect of high parents' subjective neighborhood safety on executive functioning is weaker in Asian than non-Hispanic White children (Table 4).

In Figure 2a, there was an overall and positive association between parents' subjective neighborhood safety and executive functioning. As shown by Figure 2b, the boosting effect of high parents' subjective neighborhood safety on executive functioning was weaker in Asian than non-Hispanic White children.

3.2.3. Learning and Memory—In Table 5, there are two linear regression models that report the association of interest for our third cognitive outcome in the overall (pooled) sample, in the absence and presence of the interaction terms. Model 1 (Main Effect Model) did not show any effect of high parents' subjective neighborhood safety on learning and memory score. Model 2 (Interaction Model) showed a statistically significant interaction between the effects of race/ethnicity and parents' subjective neighborhood safety on learning and memory score, suggesting that the effect of high parents' subjective neighborhood safety on learning and memory score is larger for children from the Other race/ethnicity group than non-Hispanic White children (Table 5).

In Figure 3a, there was no overall association between parents' subjective neighborhood safety and learning and memory score. As shown by Figure 3b, the effect of high parents' subjective neighborhood safety on learning and memory score was larger for the Other race/ethnic group than non-Hispanic White children.

4. Discussion

Overall, the associations between parents' subjective neighborhood safety and children's cognitive performance were not invariant across children's race/ethnic groups and cognitive domains. Compared to non-Hispanic Whites, Asian American children showed a weaker effect of parents' subjective neighborhood safety on executive function, while "Other" race/ethnic children showed a larger effect of parents' subjective neighborhood safety on general cognitive performance and learning and memory. Our observation in Asian families was in line with our hypothesis, and our observation in "Other" race/ethnic children was against our hypothesis. In line with MDRs, we expected weaker effects of neighborhood safety on cognitive function of racial and ethnic minorities than non-Hispanic Whites.

In this study, there was a weaker effect for executive function for Asian American compared to Non-Hispanic White children. There may be a ceiling effect of neighborhood safety or cognitive function for Asian children. Asian Americans may also experience MDRs due to their marginalized status in the U.S. Similar to other non-White groups, Asians may experience diminished returns of neighborhood safety in relation to their child cognitive development. In one study, parental education showed a weaker effect on Asian American children's than White children's math scores [71]. In another study, while income reduced tobacco use for non-Hispanic Whites, high SES increased the risk of use for Asian Americans [72]. Thus, while other explanations should be kept in mind, MDRs have been previously observed for various racial/ethnic minority groups. Nevertheless, our finding stands in opposition to previous arguments of Asian American parity with non-Hispanic Whites (e.g., model minority stereotype) [73–75] by showing that Asians suffer disadvantages as a racialized minority group.

We observed a stronger effect of neighborhood safety on children's cognitive function of the Other-racial group. It is also unclear why we did not see MDRs for Hispanics. Future research should attempt to identify those who identify as "other" to help illuminate avenues to understanding the complex interrelationship between race, neighborhood safety, and cognitive functioning. This line of work needs more research.

Two competing and complementary models have been used to study the simultaneous and joint effects of race and parents' subjective neighborhood safety on children's outcomes. The first, which has traditionally dominated the field, attributes racial and ethnic gaps in outcomes to the scarcity of economic resources and high prevalence of risk factors in the lives of racial and ethnic minorities [76–79]. Some of the research engaged in this line of work suggests that economic status may partially mediate the effects of race on health outcomes [80]. These studies advocate for enhancing racial and ethnic minority groups' economic status as the main strategy to close the racial differences in children's outcomes [81,82]. The second, the Marginalization-related Diminished Returns (MDRs) [55], refer to weaker effects of economic resources on tangible outcomes of racial and ethnic minorities than non-Hispanic Whites. This model has received overwhelming support, suggesting that various indicators such as subjective neighborhood safety [59] and SES indicators [83] generate fewer desired outcomes for racial and ethnic minorities than non-Hispanic Whites. Our second findings confirm the MDRs of subjective neighborhood safety: neighborhood safety may not generate identical outcomes for diverse groups of children.

Race and ethnic variation in the association between parents' subjective neighborhood safety and children's cognitive performance of diverse racial and ethnic children are in line with the results of previous work on MDRs of SES and neighborhood safety for non-Hispanic Black and Hispanic compared to non-Hispanic White children [84]. Racial and ethnic variations in the returns of resources are repeatedly established at the individual and family levels. These racial and ethnic variations in returns of SES and neighborhood conditions are robust, as they are found to hold across socioeconomic resources (e.g., parental education, income, family structure), developmental phases, outcomes, and sources of marginalization [55]. Racial and ethnic groups differ in the effects of various SES indicators such as income [85] and education [84] on a wide range of cognitive, emotional, behavioral, and health outcomes. Most of the past research, however, has established a difference between the returns of SES between non-Hispanic Whites and non-Hispanic Blacks [85]. While these MDRs are not specific to non-Hispanic Blacks [71], the existing knowledge on other ethnic groups is limited.

In summary, this study suggests that the perception of neighborhood safety is a resource that has important implications for child development, but this resource is inequitably distributed by race/ethnicity (partly due to SES disparities), and that there are diminished returns of this resource, i.e., lower effect of perceived neighborhood safety on cognition in marginalized groups.

A wide range of societal mechanisms may explain how SES and environmental resources or assets may enhance outcomes in some but not other racial/ethnic groups. Racial and ethnic minority communities, families, and individuals face a wide range of stressors that are not

due to economic resources but social stratification, racism, and discrimination. These non-economic adversities are environmental, structural, and are related to race, racialization, and marginalization. These adversities can be seen across all economic levels [86]. Economic upward social mobility's health returns may be limited when the likelihood of upward social mobility is difficult and unlikely [87]. Increased exposure to stress is believed to reduce children's ability to benefit from their available SES resources such as parental education and income. For racial and ethnic minority families, an increase in economic status may increase experience [88] and vulnerability [59] to discrimination. This might be because non-White families who have economic resources are more likely to be surrounded by non-Hispanic White families, which increases their exposure to discriminatory events [88]. High levels of racial and ethnic discrimination, general stress, and fear of neighborhood violence may operate as risk factors for many outcomes, including but not limited to poor cognitive performance. Living in such stressful conditions may reduce the returns of SES and other available resources on children's outcomes [59].

Residential and school segregation may also explain the observed differences across racial and ethnic groups in neighborhood perception of safety. As a result of residential segregation, racial and ethnic minority children, across all economic levels, are often relegated to low-quality housing and schools and reside in unsafe, stressful neighborhoods [89]. This results in the lower-than-expected effects of resources and environmental factors on children's education and schooling for racial and ethnic minority groups. For example, it has been shown that while high SES non-Hispanic White children attend resourced schools that are located in suburban areas with available financial resources and well-prepared teachers, high SES racial and ethnic minority children are more likely to go to schools that have lower levels of resources and less prepared teachers [29]. These disparities might be mitigated if residential and school segregation are eliminated.

Race/ethnic differences in cognitive performance reported here are not due to genetic differences but a longstanding legacy of institutional and structural discrimination [90]. There is a long history of racist narratives that pushed the idea that race is causally and biologically linked to cognitive capacities and general intelligence [91]. This paper breaks with such reductionist and racist assumptions by showing that what was historically taken to be biologically shaped is not due to race per se but various social, environmental, and economic consequences of unjust practices and racist public policies. We conceptualize race as a proxy of racialization, and we exclusively focused on the role of race as a social factor, which bounds the health returns of economic resources. The argument here is that in a race-aware society that has historically held racial and ethnic groups behind, family- and individual-level factors are not enough to secure desired outcomes. This is in part because even when they have high economic resources, families of color still report high levels of stress as they face various societal barriers [92]. Non-Hispanic White families with similar economic status, however, skip such stressors in their daily lives [59]. As evidenced by work in Critical Race Theory, our studies show that racism is a dynamic socio-political process that lessens the life chances and societal standing of racialized groups. These *racialized* groups then experience worse health outcomes including lower cognitive function and higher morbidity and mortality due to society's operational, political, and socio-economic norms [93]. While these conditions may affect biological and physiological factors, the

racism of the society, not assumed differences across groups' biology, causes unequal outcomes.

Although neighborhood-level disadvantage imposes risks to families of color across SES levels, those are not the only risks contributing to poor health among racial and ethnic minority families. MDRs introduce another set of disadvantages that sustains above and beyond SES [55]. While the solution to low SES is to equalize access to resources, the solution to racial and ethnic variation in the returns of SES resources requires us to equalize the marginal returns from the same resources. The inequalities that are due to differential marginal returns may be resistant to our policies that aim to close the racial and ethnic gap in economic resources. Future research should decompose inequalities due to differential marginal returns of resources from those due to differential access to resources. Similarly, policymakers should be aware of MDR-related processes as a driver of racial and ethnic inequalities in child development. Racial and ethnic groups, to this end, may experience both limited resources and MDRs of available resources. A potential solution should make economic resources available to the communities of color and, at the same time, ensure that those resources can be utilized and are equally beneficial to individuals and families across racial/ethnic groups [55].

Scholars have recently studied the life experiences of middle-class racial and ethnic minority American families [55]. This line of research has shown that middle-class families of color experience class and SES in a different manner than middle-class non-Hispanic White families. Previous research has shown that high SES may even operate as a source of vulnerability for racial and ethnic minority families by increasing their exposure and sensitivity to discrimination via placing them in proximity to non-Hispanic Whites [94–97].

Well-documented by the MDRs literature, economic resources of oneself [84] and one's parents [45] generate fewer desired outcomes for racial and ethnic minority groups. Racial and ethnic minority groups differ in their opportunities to mobilize the resources that they access in order to secure tangible outcomes [55]. In the presence of MDRs, racialized children (e.g., Asian, Black, Hispanic) may develop worse-than-expected outcomes when compared to non-Hispanic White children, even when their resources are similar, a pattern frequently reported across economic and health outcomes [55]. While these MDRs are shown for the effects of family SES on neurocognitive measures [98], we are not aware of any previous studies on MDRs of neighborhood safety on various domains of cognitive performance.

5. Study Limitations

Our study had a few methodological limitations. Cross-sectional studies such as ours cannot determine causal effects. As cross-sectional data, we only had a single observation from each variable, without time as a variable. Residual bias due to uncontrolled confounders is possible. Several variables such as individual or neighborhood level socioeconomic inequality were not measured. Other variables that were not measured included parental drug abuse/alcohol history, neighborhood deprivation, and region of residence. These omitted variables may have implications for the association of interest. A major limitation is

lack of detailed data on the places, cities, and neighborhoods where the participant lives. In our study, it was unclear what characteristics the neighborhoods had. Future research may disaggregate these data by city and neighborhood. Thus, there is more research needed before we can make recommendations to cities for interventions and policies. This could also allow researchers to comment on objective physical and mental health outcomes that require analysis of state-, zip code-, or county-level data. In addition, we had minimal knowledge about racial and ethnic composition of the “Other” racial group, so it is hard to generalize the results related to this group. In addition, we did not study genetic factors, because this was a sociological not a biological study of cognition. The small R-squared values from all the models, including the models with interaction terms, indicate a small explaining power of all the variables included in the models. The change in the R-squared for executive function was only 1.5%, which is not large. None of these limitations, however, are fatal flaws. This study, however, provides a first look at the association between parents’ subjective neighborhood safety and child cognitive performance across racial and ethnic groups.

6. Conclusions

The results suggest that diverse racial and ethnic groups differ in their social determinants of cognitive function. Effects of perceived neighborhood quality are not universal and depend on race/ethnicity and cognitive domain. Children’s cognitive function is shaped by a complex interaction between the individual and social array of factors; meaning that paths, effects, and correlations may vary across diverse groups. The same intervention may be associated with a different response across diverse racial and ethnic groups.

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Appendix A

Model Formula

<p>General cognitive performance</p> <p><i>Model 1</i></p> <p>neurocog_pc1.bl ~ neighb_phenx_ss_mean_p + race_ethnicity + high.educ.bl + household.income.bl + married.bl + age + sex</p> <p>Random: ~(1 rel_family_id)</p> <p><i>Model 2</i></p> <p>neurocog_pc1.bl ~ neighb_phenx_ss_mean_p + race_ethnicity + high.educ.bl + household.income.bl + married.bl + age + sex + neighb_phenx_ss_mean_p * race_ethnicity</p> <p>Random: ~(1 rel_family_id)</p> <p>Executive functioning</p> <p><i>Model 1</i></p> <p>neurocog_pc2.bl ~ neighb_phenx_ss_mean_p + race_ethnicity + high.educ.bl + household.income.bl + married.bl + age + sex</p>

Random: ~(1|rel_family_id)

Model 2

neurocog_pc2.bl ~ neighb_phenx_ss_mean_p + race_ethnicity + high.educ.bl + household.income.bl + married.bl + age + sex + neighb_phenx_ss_mean_p * race_ethnicity

Random: ~(1|rel_family_id)

Learning and memory

Model 1

neurocog_pc3.bl ~ neighb_phenx_ss_mean_p + race_ethnicity + high.educ.bl + household.income.bl + married.bl + age + sex

Random: ~(1|rel_family_id)

Model 2

neurocog_pc3.bl ~ neighb_phenx_ss_mean_p + race_ethnicity + high.educ.bl + household.income.bl + married.bl + age + sex + neighb_phenx_ss_mean_p * race_ethnicity

Random: ~(1|rel_family_id)

References

1. Benner AD; Crosnoe R The racial/ethnic composition of elementary schools and young children's academic and socioemotional functioning. *American Educational Research Journal* 2011, 48, 621–646. [PubMed: 26336320]
2. De Feyter JJ; Winsler A The early developmental competencies and school readiness of low-income, immigrant children: Influences of generation, race/ethnicity, and national origins. *Early childhood research quarterly* 2009, 24, 411–431.
3. Duncan AF; Watterberg KL; Nolen TL; Vohr BR; Adams-Chapman I; Das A; Lowe J; Health, E.K.S.N.I.o.C.; Network, H.D.N.R. Effect of ethnicity and race on cognitive and language testing at age 18–22 months in extremely preterm infants. *The Journal of pediatrics* 2012, 160, 966–971. e962. [PubMed: 22269248]
4. Philbrook LE; Shimizu M; Buckhalt JA; El-Sheikh M Sleepiness as a pathway linking race and socioeconomic status with academic and cognitive outcomes in middle childhood. *Sleep Health* 2018, 4, 405–412, doi:10.1016/j.sleh.2018.07.008. [PubMed: 30241654]
5. Bumpus JP; Umeh Z; Harris AL Social Class and Educational Attainment: Do Blacks Benefit Less from Increases in Parents' Social Class Status? *Sociology of Race and Ethnicity* 0, 2332649219854465, doi:10.1177/2332649219854465.
6. Taylor RL; Cooper SR; Jackson JJ; Barch DM Assessment of neighborhood poverty, cognitive function, and prefrontal and hippocampal volumes in children. *JAMA network open* 2020, 3, e2023774–e2023774. [PubMed: 33141160]
7. Cohen GL; Sherman DK Stereotype threat and the social and scientific contexts of the race achievement gap. *Am Psychol* 2005, 60, 270–271; discussion 271–272, doi:10.1037/0003-066X.60.3.270. [PubMed: 15796692]
8. Burchinal M; McCartney K; Steinberg L; Crosnoe R; Friedman SL; McLoyd V; Pianta R; Network, N.E.C.C.R. Examining the Black-White achievement gap among low-income children using the NICHD study of early child care and youth development. *Child Dev* 2011, 82, 1404–1420, doi:10.1111/j.1467-8624.2011.01620.x. [PubMed: 21790543]
9. Gorey KM Comprehensive School Reform: Meta-Analytic Evidence of Black-White Achievement Gap Narrowing. *Educ Policy Anal Arch* 2009, 17, 1–17. [PubMed: 27453681]
10. Hair NL; Hanson JL; Wolfe BL; Pollak SD Association of Child Poverty, Brain Development, and Academic Achievement. *JAMA Pediatr* 2015, 169, 822–829, doi:10.1001/jamapediatrics.2015.1475. [PubMed: 26192216]
11. Sharkey P; Elwert F The legacy of disadvantage: Multigenerational neighborhood effects on cognitive ability. *American journal of sociology* 2011, 116, 1934–1981.

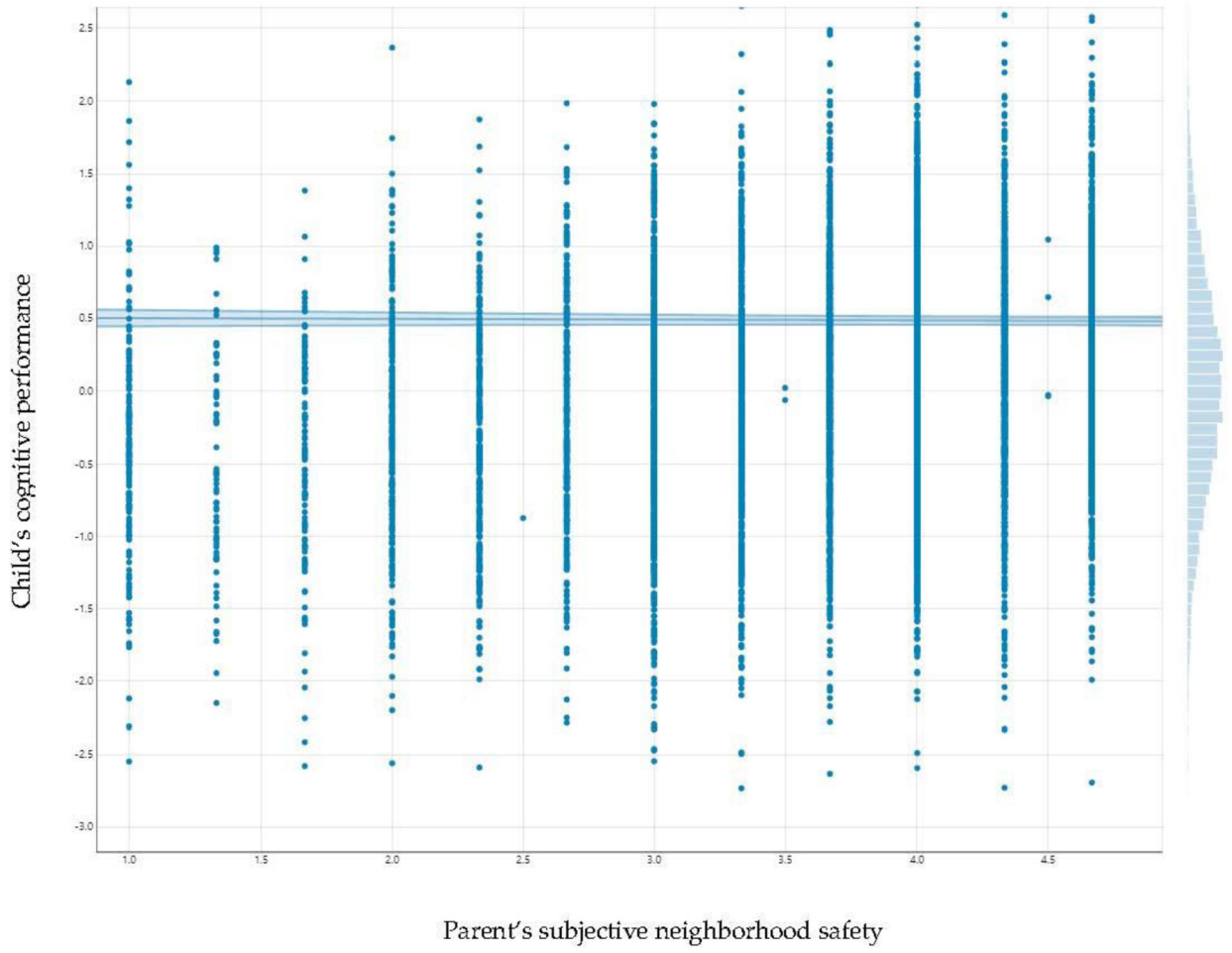
12. Aneshensel CS; Ko MJ; Chodosh J; Wight RG The urban neighborhood and cognitive functioning in late middle age. *Journal of Health and Social Behavior* 2011, 52, 163–179. [PubMed: 21673145]
13. Caughy MOB; O'campo PJ Neighborhood poverty, social capital, and the cognitive development of African American preschoolers. *American journal of community psychology* 2006, 37, 141. [PubMed: 16680542]
14. Shih RA; Ghosh-Dastidar B; Margolis KL; Slaughter ME; Jewell A; Bird CE; Eibner C; Denburg NL; Ockene J; Messina CR Neighborhood socioeconomic status and cognitive function in women. *American journal of public health* 2011, 101, 1721–1728. [PubMed: 21778482]
15. Sisco SM; Marsiske M Neighborhood influences on late life cognition in the ACTIVE study. *Journal of Aging Research* 2012, 2012.
16. Alvarado SE The impact of childhood neighborhood disadvantage on adult joblessness and income. *Soc Sci Res* 2018, 70, 1–17, doi:10.1016/j.ssresearch.2017.10.004. [PubMed: 29455736]
17. Barreto SM; de Figueiredo RC; Giatti L Socioeconomic inequalities in youth smoking in Brazil. *BMJ Open* 2013, 3, e003538, doi:10.1136/bmjopen-2013-003538.
18. Schreier HM; Chen E Socioeconomic status and the health of youth: a multilevel, multidomain approach to conceptualizing pathways. *Psychol Bull* 2013, 139, 606–654, doi:10.1037/a0029416. [PubMed: 22845752]
19. Hemovich V; Lac A; Crano WD Understanding early-onset drug and alcohol outcomes among youth: the role of family structure, social factors, and interpersonal perceptions of use. *Psychol Health Med* 2011, 16, 249–267, doi:10.1080/13548506.2010.532560. [PubMed: 21491334]
20. Williams DR; Collins C Racial residential segregation: a fundamental cause of racial disparities in health. *Public health reports* 2016.
21. Rothstein R *The color of law: A forgotten history of how our government segregated America*; Liveright Publishing: 2017.
22. Yelin E; Trupin L; Bunde J; Yazdany J Poverty, Neighborhoods, Persistent Stress, and Systemic Lupus Erythematosus Outcomes: A Qualitative Study of the Patients' Perspective. *Arthritis Care Res (Hoboken)* 2019, 71, 398–405, doi:10.1002/acr.23599. [PubMed: 29781579]
23. Harnett NG; Wheelock MD; Wood KH; Goodman AM; Mrug S; Elliott MN; Schuster MA; Tortolero S; Knight DC Negative life experiences contribute to racial differences in the neural response to threat. *Neuroimage* 2019, 202, 116086, doi:10.1016/j.neuroimage.2019.116086. [PubMed: 31401241]
24. Schulz AJ; Mentz G; Lachance L; Johnson J; Gaines C; Israel BA Associations between socioeconomic status and allostatic load: effects of neighborhood poverty and tests of mediating pathways. *Am J Public Health* 2012, 102, 1706–1714, doi:10.2105/AJPH.2011.300412. [PubMed: 22873478]
25. Cummings JR Contextual socioeconomic status and mental health counseling use among US adolescents with depression. *J Youth Adolesc* 2014, 43, 1151–1162, doi:10.1007/s10964-013-0021-7. [PubMed: 24114588]
26. Takada M; Kondo N; Hashimoto H; Committee, J.S.D.M. Japanese study on stratification, health, income, and neighborhood: study protocol and profiles of participants. *J Epidemiol* 2014, 24, 334–344, doi:10.2188/jea.je20130084. [PubMed: 24814507]
27. Nogueira GJ; Castro A; Naveira L; Nogueira-Antunano F; Natinzon A; Gigli SL; Grossi MC; Frugone M; Leofanti H; Marchesi M [Evaluation of the higher brain functions in 1st and 7th grade schoolchildren belonging to two different socioeconomic groups]. *Rev Neurol* 2005, 40, 397–406. [PubMed: 15849672]
28. Richards M; James SN; Sizer A; Sharma N; Rawle M; Davis DHJ; Kuh D Identifying the lifetime cognitive and socioeconomic antecedents of cognitive state: seven decades of follow-up in a British birth cohort study. *BMJ Open* 2019, 9, e024404, doi:10.1136/bmjopen-2018-024404.
29. Jefferson AL; Gibbons LE; Rentz DM; Carvalho JO; Manly J; Bennett DA; Jones RN A life course model of cognitive activities, socioeconomic status, education, reading ability, and cognition. *J Am Geriatr Soc* 2011, 59, 1403–1411, doi:10.1111/j.1532-5415.2011.03499.x. [PubMed: 21797830]

30. Manly JJ; Jacobs DM; Touradji P; Small SA; Stern Y Reading level attenuates differences in neuropsychological test performance between African American and White elders. *J Int Neuropsychol Soc* 2002, 8, 341–348, doi:10.1017/s1355617702813157. [PubMed: 11939693]
31. Larson K; Russ SA; Nelson BB; Olson LM; Halfon N Cognitive ability at kindergarten entry and socioeconomic status. *Pediatrics* 2015, 135, e440–448, doi:10.1542/peds.2014-0434. [PubMed: 25601983]
32. Vargas T; Rakhshan Rouhakhtar PJ; Schiffman J; Zou DS; Rydland KJ; Mittal VA Neighborhood crime, socioeconomic status, and suspiciousness in adolescents and young adults at Clinical High Risk (CHR) for psychosis. *Schizophr Res* 2020, 215, 74–80, doi:10.1016/j.schres.2019.11.024. [PubMed: 31759810]
33. Gerra G; Benedetti E; Resce G; Potente R; Cutilli A; Molinaro S Socioeconomic Status, Parental Education, School Connectedness and Individual Socio-Cultural Resources in Vulnerability for Drug Use among Students. *Int J Environ Res Public Health* 2020, 17, doi:10.3390/ijerph17041306.
34. Rodriguez JM; Karlamangla AS; Gruenewald TL; Miller-Martinez D; Merkin SS; Seeman TE Social stratification and allostatic load: shapes of health differences in the MIDUS study in the United States. *J Biosoc Sci* 2019, 10.1017/S0021932018000378, 1–18, doi:10.1017/S0021932018000378.
35. Schibli K; Wong K; Hedayati N; D'Angiulli A Attending, learning, and socioeconomic disadvantage: developmental cognitive and social neuroscience of resilience and vulnerability. *Ann N Y Acad Sci* 2017, 1396, 19–38, doi:10.1111/nyas.13369. [PubMed: 28548461]
36. Kelishadi R; Jari M; Qorbani M; Motlagh ME; Ardalan G; Bahreynian M; Kasaean A; Ahadi Z; Najafi F; Asayesh H, et al. Does the socioeconomic status affect the prevalence of psychiatric distress and violent behaviors in children and adolescents? The CASPIAN-IV study. *Minerva Pediatr* 2017, 69, 264–273, doi:10.23736/S0026-4946.16.04266-3. [PubMed: 26329658]
37. Poh BK; Lee ST; Yeo GS; Tang KC; Noor Afifah AR; Siti Hanisa A; Parikh P; Wong JE; Ng ALO; Group SS Low socioeconomic status and severe obesity are linked to poor cognitive performance in Malaysian children. *BMC Public Health* 2019, 19, 541, doi:10.1186/s12889-019-6856-4. [PubMed: 31196019]
38. Karlsson O; De Neve JW; Subramanian SV Weakening association of parental education: analysis of child health outcomes in 43 low- and middle-income countries. *Int J Epidemiol* 2018, 10.1093/ije/dyy158, doi:10.1093/ije/dyy158.
39. Madhushanthi HJ; Wimalasekera SW; Goonewardena CSE; Amarasekara A; Lenora J Socioeconomic status is a predictor of neurocognitive performance of early female adolescents. *Int J Adolesc Med Health* 2018, 10.1515/ijamh-2018-0024, doi:10.1515/ijamh-2018-0024.
40. Christensen DL; Schieve LA; Devine O; Drews-Botsch C Socioeconomic status, child enrichment factors, and cognitive performance among preschool-age children: results from the Follow-Up of Growth and Development Experiences study. *Res Dev Disabil* 2014, 35, 1789–1801, doi:10.1016/j.ridd.2014.02.003. [PubMed: 24679548]
41. Bouthoorn SH; Wijtzes AI; Jaddoe VW; Hofman A; Raat H; van Lenthe FJ Development of socioeconomic inequalities in obesity among Dutch pre-school and school-aged children. *Obesity (Silver Spring)* 2014, 22, 2230–2237, doi:10.1002/oby.20843. [PubMed: 25044908]
42. Senn TE; Walsh JL; Carey MP The mediating roles of perceived stress and health behaviors in the relation between objective, subjective, and neighborhood socioeconomic status and perceived health. *Ann Behav Med* 2014, 48, 215–224, doi:10.1007/s12160-014-9591-1. [PubMed: 24648016]
43. Assari S Perceived Neighborhood Safety Better Predicts Risk of Mortality for Whites than Blacks. *J Racial Ethn Health Disparities* 2016, 10.1007/s40615-016-0297-x, doi:10.1007/s40615-016-0297-x.
44. Marmot M *The Status Syndrome: How Social Standing Affects Our Health and Longevity*. London: Bloomsbury Press. . 2004.
45. Assari S Parental Education on Youth Inhibitory Control in the Adolescent Brain Cognitive Development (ABCD) Study: Blacks' Diminished Returns. *Brain Sci* 2020, 10, doi:10.3390/brainsci10050312.

46. Manuck SB; Phillips JE; Gianaros PJ; Flory JD; Muldoon MF Subjective socioeconomic status and presence of the metabolic syndrome in midlife community volunteers. *Psychosom Med* 2010, 72, 35–45, doi:10.1097/PSY.0b013e3181c484dc. [PubMed: 19933505]
47. Wright CE; Steptoe A Subjective socioeconomic position, gender and cortisol responses to waking in an elderly population. *Psychoneuroendocrinology* 2005, 30, 582–590, doi:10.1016/j.psyneuen.2005.01.007. [PubMed: 15808928]
48. Moon C Subjective economic status, sex role attitudes, fertility, and mother’s work. *Ingu Pogon Nonjip* 1987, 7, 177–196. [PubMed: 12280803]
49. Nicksic NE; Salahuddin M; Butte NF; Hoelscher DM Associations Between Parent-Perceived Neighborhood Safety and Encouragement and Child Outdoor Physical Activity Among Low-Income Children. *J Phys Act Health* 2018, 15, 317–324, doi:10.1123/jpah.2017-0224. [PubMed: 29485931]
50. Singh GK; Ghandour RM Impact of neighborhood social conditions and household socioeconomic status on behavioral problems among US children. *Matern Child Health J* 2012, 16 Suppl 1, S158–169, doi:10.1007/s10995-012-1005-z. [PubMed: 22481571]
51. Westley T; Kaczynski AT; Stanis SAW; Besenyi GM Parental neighborhood safety perceptions and their children’s health behaviors: Associations by child age, gender and household income. *Children Youth and Environments* 2013, 23, 118–147.
52. Ursache A; Noble KG; Blair C Socioeconomic Status, Subjective Social Status, and Perceived Stress: Associations with Stress Physiology and Executive Functioning. *Behav Med* 2015, 41, 145–154, doi:10.1080/08964289.2015.1024604. [PubMed: 26332932]
53. Feldman PJ; Steptoe A How neighborhoods and physical functioning are related: the roles of neighborhood socioeconomic status, perceived neighborhood strain, and individual health risk factors. *Ann Behav Med* 2004, 27, 91–99, doi:10.1207/s15324796abm2702_3. [PubMed: 15026293]
54. Assari S; Smith J; Mistry R; Farokhnia M; Bazargan M Substance Use among Economically Disadvantaged African American Older Adults; Objective and Subjective Socioeconomic Status. *Int J Environ Res Public Health* 2019, 16, doi:10.3390/ijerph16101826.
55. Assari S Health Disparities due to Diminished Return among Black Americans: Public Policy Solutions. *Social Issues and Policy Review* 2018, 12, 112–145, doi:10.1111/sipr.12042.
56. Link BG; Phelan J The social shaping of health and smoking. *Drug Alcohol Depend* 2009, 104 Suppl 1, S6–10, doi:10.1016/j.drugalcdep.2009.03.002. [PubMed: 19477607]
57. Phelan JC; Link BG; Diez-Roux A; Kawachi I; Levin B “Fundamental causes” of social inequalities in mortality: a test of the theory. *J Health Soc Behav* 2004, 45, 265–285, doi:10.1177/002214650404500303. [PubMed: 15595507]
58. Link BG; Phelan J Social conditions as fundamental causes of disease. *J Health Soc Behav* 1995, Spec No, 80–94. [PubMed: 7560851]
59. Assari S; Preiser B; Lankarani MM; Caldwell CH Subjective Socioeconomic Status Moderates the Association between Discrimination and Depression in African American Youth. *Brain Sci* 2018, 8, doi:10.3390/brainsci8040071.
60. Jacques T; Seitz AR Moderating effects of visual attention and action video game play on perceptual learning with the texture discrimination task. *Vision Res* 2020, 10.1016/j.visres.2020.02.003, doi:10.1016/j.visres.2020.02.003.
61. King J; Markant J Individual differences in selective attention and scanning dynamics influence children’s learning from relevant non-targets in a visual search task. *J Exp Child Psychol* 2020, 193, 104797, doi:10.1016/j.jecp.2019.104797. [PubMed: 31991262]
62. Alcohol Research: Current Reviews Editorial, S. NIH’s Adolescent Brain Cognitive Development (ABCD) Study. *Alcohol Res* 2018, 39, 97. [PubMed: 30557152]
63. Casey BJ; Cannonier T; Conley MI; Cohen AO; Barch DM; Heitzeg MM; Soules ME; Teslovich T; Dellarco DV; Garavan H, et al. The Adolescent Brain Cognitive Development (ABCD) study: Imaging acquisition across 21 sites. *Dev Cogn Neurosci* 2018, 32, 43–54, doi:10.1016/j.dcn.2018.03.001. [PubMed: 29567376]
64. Karcher NR; O’Brien KJ; Kandala S; Barch DM Resting-State Functional Connectivity and Psychotic-like Experiences in Childhood: Results From the Adolescent Brain Cognitive

- Development Study. *Biol Psychiatry* 2019, 86, 7–15, doi:10.1016/j.biopsych.2019.01.013. [PubMed: 30850130]
65. Lisdahl KM; Sher KJ; Conway KP; Gonzalez R; Feldstein Ewing SW; Nixon SJ; Tapert S; Bartsch H; Goldstein RZ; Heitzeg M Adolescent brain cognitive development (ABCD) study: Overview of substance use assessment methods. *Dev Cogn Neurosci* 2018, 32, 80–96, doi:10.1016/j.dcn.2018.02.007. [PubMed: 29559216]
 66. Luciana M; Bjork JM; Nagel BJ; Barch DM; Gonzalez R; Nixon SJ; Banich MT Adolescent neurocognitive development and impacts of substance use: Overview of the adolescent brain cognitive development (ABCD) baseline neurocognition battery. *Dev Cogn Neurosci* 2018, 32, 67–79, doi:10.1016/j.dcn.2018.02.006. [PubMed: 29525452]
 67. Aucther AM; Hernandez Mejia M; Heyser CJ; Shilling PD; Jernigan TL; Brown SA; Tapert SF; Dowling GJ A description of the ABCD organizational structure and communication framework. *Dev Cogn Neurosci* 2018, 32, 8–15, doi:10.1016/j.dcn.2018.04.003. [PubMed: 29706313]
 68. Garavan H; Bartsch H; Conway K; Decastro A; Goldstein RZ; Heeringa S; Jernigan T; Potter A; Thompson W; Zabs D Recruiting the ABCD sample: Design considerations and procedures. *Dev Cogn Neurosci* 2018, 32, 16–22, doi:10.1016/j.dcn.2018.04.004. [PubMed: 29703560]
 69. Thompson WK; Barch DM; Bjork JM; Gonzalez R; Nagel BJ; Nixon SJ; Luciana M The structure of cognition in 9 and 10 year-old children and associations with problem behaviors: Findings from the ABCD study's baseline neurocognitive battery. *Dev Cogn Neurosci* 2019, 36, 100606, doi:10.1016/j.dcn.2018.12.004. [PubMed: 30595399]
 70. Echeverria SE; Diez-Roux AV; Link BG Reliability of self-reported neighborhood characteristics. *Journal of Urban Health* 2004, 81, 682–701. [PubMed: 15466849]
 71. Assari S; Boyce S; Bazargan M; Caldwell CH Mathematical Performance of American Youth: Diminished Returns of Educational Attainment of Asian-American Parents. *Education Sciences* 2020, 10, 32. [PubMed: 32201681]
 72. Assari S Diminished Returns of Income Against Cigarette Smoking Among Chinese Americans. *Journal of health economics and development* 2019, 1, 1.
 73. Hu A Asian Americans: Model minority or double minority? *Amerasia Journal* 1989, 15, 243–257.
 74. Wong P; Lai CF; Nagasawa R; Lin T Asian Americans as a model minority: Self-perceptions and perceptions by other racial groups. *Sociological perspectives* 1998, 41, 95–118.
 75. Osajima K Asian Americans as the model minority: An analysis of the popular press image in the 1960s and 1980s. *A companion to Asian American studies* 2005, 1, 215–225.
 76. Kaufman JS; Cooper RS; McGee DL Socioeconomic status and health in blacks and whites: the problem of residual confounding and the resiliency of race. *Epidemiology* 1997, 621–628. [PubMed: 9345660]
 77. Bell CN; Sacks TK; Thomas Tobin CS; Thorpe RJ Jr. Racial Non-equivalence of Socioeconomic Status and Self-rated Health among African Americans and Whites. *SSM Popul Health* 2020, 10, 100561, doi:10.1016/j.ssmph.2020.100561. [PubMed: 32140544]
 78. Samuel LJ; Roth DL; Schwartz BS; Thorpe RJ; Glass TA Socioeconomic Status, Race/Ethnicity, and Diurnal Cortisol Trajectories in Middle-Aged and Older Adults. *J Gerontol B Psychol Sci Soc Sci* 2018, 73, 468–476, doi:10.1093/geronb/gbw080. [PubMed: 27440916]
 79. Fuentes M; Hart-Johnson T; Green CR The association among neighborhood socioeconomic status, race and chronic pain in black and white older adults. *J Natl Med Assoc* 2007, 99, 1160–1169. [PubMed: 17987920]
 80. Assari S Distal, intermediate, and proximal mediators of racial disparities in renal disease mortality in the United States. *J Nephrothol* 2016, 5, 51–59, doi:10.15171/jnp.2016.09. [PubMed: 27047811]
 81. Williams DR; Costa MV; Odunlami AO; Mohammed SA Moving upstream: how interventions that address the social determinants of health can improve health and reduce disparities. *J Public Health Manag Pract* 2008, 14 Suppl, S8–17, doi:10.1097/01.PHH.0000338382.36695.42. [PubMed: 18843244]
 82. Williams DR Race, socioeconomic status, and health the added effects of racism and discrimination. 1999.

83. Assari S; Caldwell CH; Bazargan M Association Between Parental Educational Attainment and Youth Outcomes and Role of Race/Ethnicity. *JAMA Netw Open* 2019, 2, e1916018, doi:10.1001/jamanetworkopen.2019.16018. [PubMed: 31755951]
84. Assari S; Farokhnia M; Mistry R Education Attainment and Alcohol Binge Drinking: Diminished Returns of Hispanics in Los Angeles. *Behav Sci (Basel)* 2019, 9, doi:10.3390/bs9010009.
85. Assari S; Caldwell CH; Mincy R Family Socioeconomic Status at Birth and Youth Impulsivity at Age 15; Blacks' Diminished Return. *Children (Basel)* 2018, 5, doi:10.3390/children5050058.
86. Bowden M; Bartkowski J; Xu X; Lewis R Jr Parental occupation and the gender math gap: Examining the social reproduction of academic advantage among elementary and middle school students. *Social Sciences* 2017, 7, 6.
87. Chetty R; Hendren N; Kline P; Saez E Where is the land of opportunity? The geography of intergenerational mobility in the United States. *The Quarterly Journal of Economics* 2014, 129, 1553–1623.
88. Assari S; Gibbons FX; Simons R Depression among Black Youth; Interaction of Class and Place. *Brain Sci* 2018, 8, doi:10.3390/brainsci8060108.
89. Assari S Parental Educational Attainment and Academic Performance of American College Students; Blacks' Diminished Returns. *Journal of Health Economics and Development* 2019, 1, 21–31. [PubMed: 31372601]
90. Chavous TM; Rivas-Drake D; Smalls C; Griffin T; Cogburn C Gender matters, too: The influences of school racial discrimination and racial identity on academic engagement outcomes among African American adolescents. *Developmental psychology* 2008, 44, 637. [PubMed: 18473633]
91. Guthrie RV Even the rat was white: A historical view of psychology; Pearson Education: 2004.
92. Assari S; Moghani Lankarani M Workplace Racial Composition Explains High Perceived Discrimination of High Socioeconomic Status African American Men. *Brain Sci* 2018, 8, doi:10.3390/brainsci8080139.
93. Curry TJ; Curry G CRITICAL RACE THEORY AND THE DEMOGRAPHY OF DEATH AND DYING. *Critical Race Theory in the Academy* 2020, 89.
94. Bailey ZD; Krieger N; Agenor M; Graves J; Linos N; Bassett MT Structural racism and health inequities in the USA: evidence and interventions. *Lancet* 2017, 389, 1453–1463, doi:10.1016/S0140-6736(17)30569-X. [PubMed: 28402827]
95. Hudson DL; Bullard KM; Neighbors HW; Geronimus AT; Yang J; Jackson JS Are benefits conferred with greater socioeconomic position undermined by racial discrimination among African American men? *J Mens Health* 2012, 9, 127–136, doi:10.1016/j.jomh.2012.03.006. [PubMed: 22707995]
96. Hudson DL; Neighbors HW; Geronimus AT; Jackson JS Racial Discrimination, John Henryism, and Depression Among African Americans. *J Black Psychol* 2016, 42, 221–243, doi:10.1177/0095798414567757. [PubMed: 27529626]
97. Hudson DL; Puterman E; Bibbins-Domingo K; Matthews KA; Adler NE Race, life course socioeconomic position, racial discrimination, depressive symptoms and self-rated health. *Soc Sci Med* 2013, 97, 7–14, doi:10.1016/j.socscimed.2013.07.031. [PubMed: 24161083]
98. Assari S; Boyce S; Bazargan M Subjective Family Socioeconomic Status and Adolescents' Attention: Blacks' Diminished Returns. *Children* 2020, 7, 80.



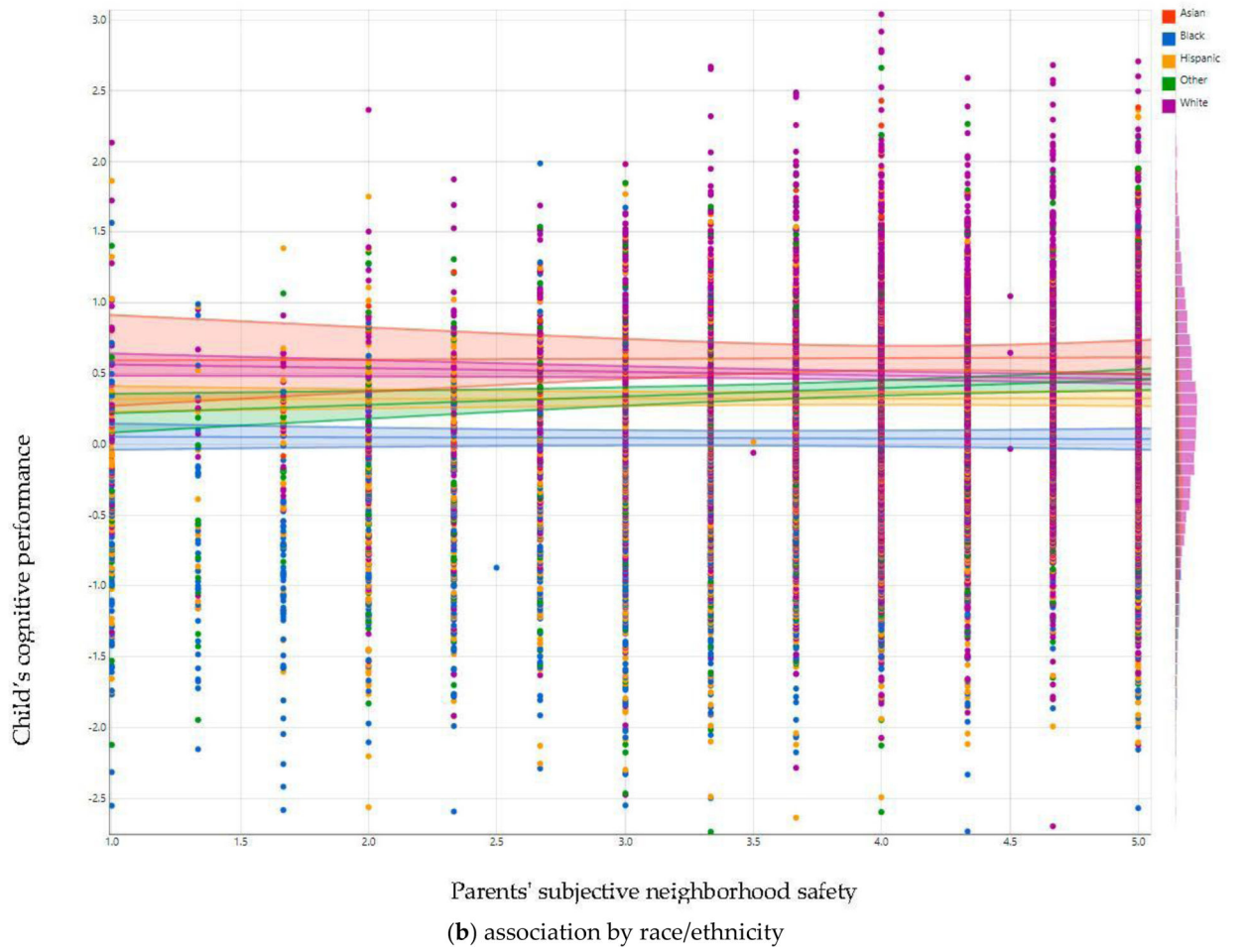
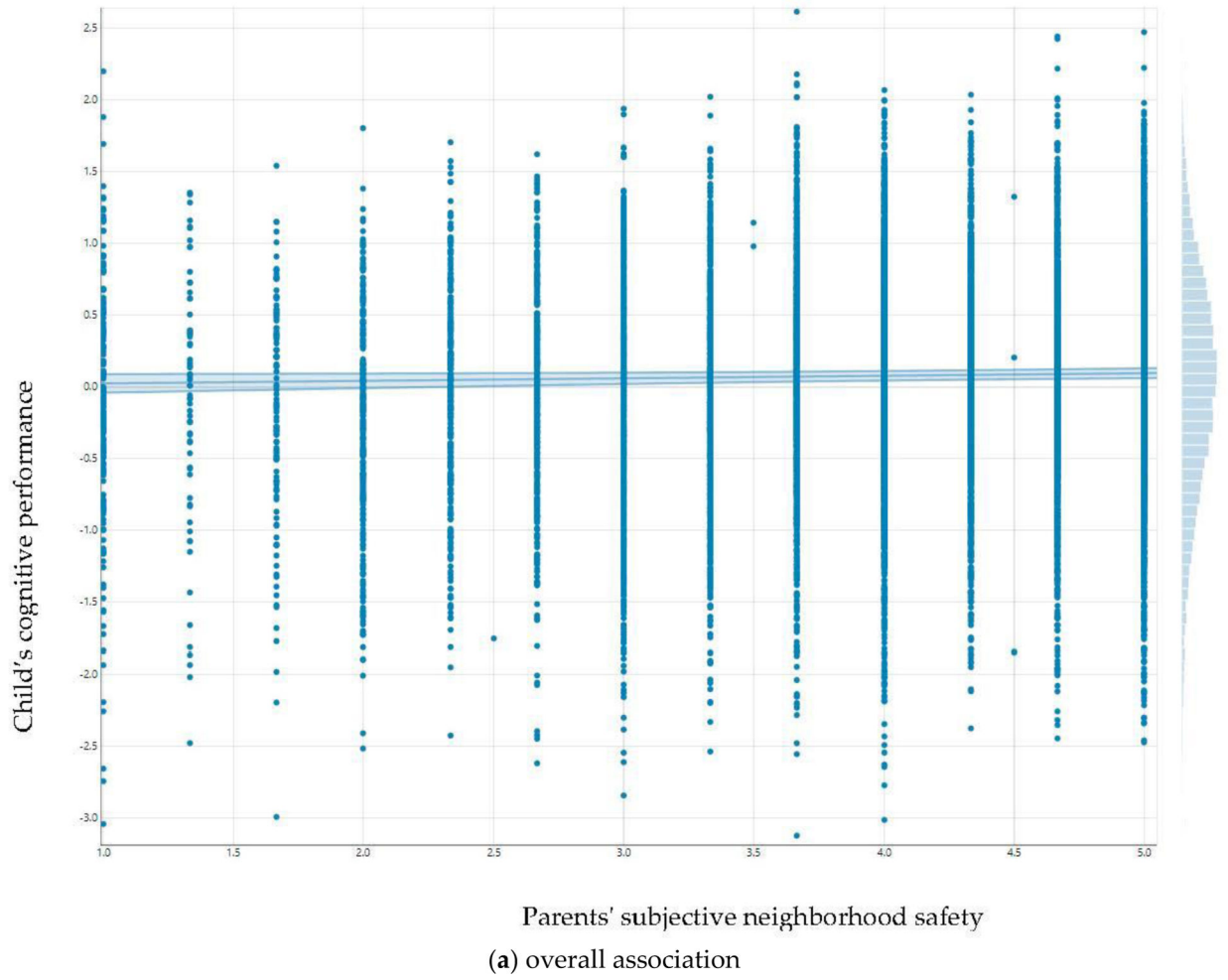


Figure 1. Association between parents' subjective neighborhood safety and children's general cognitive function overall and by race/ethnicity.



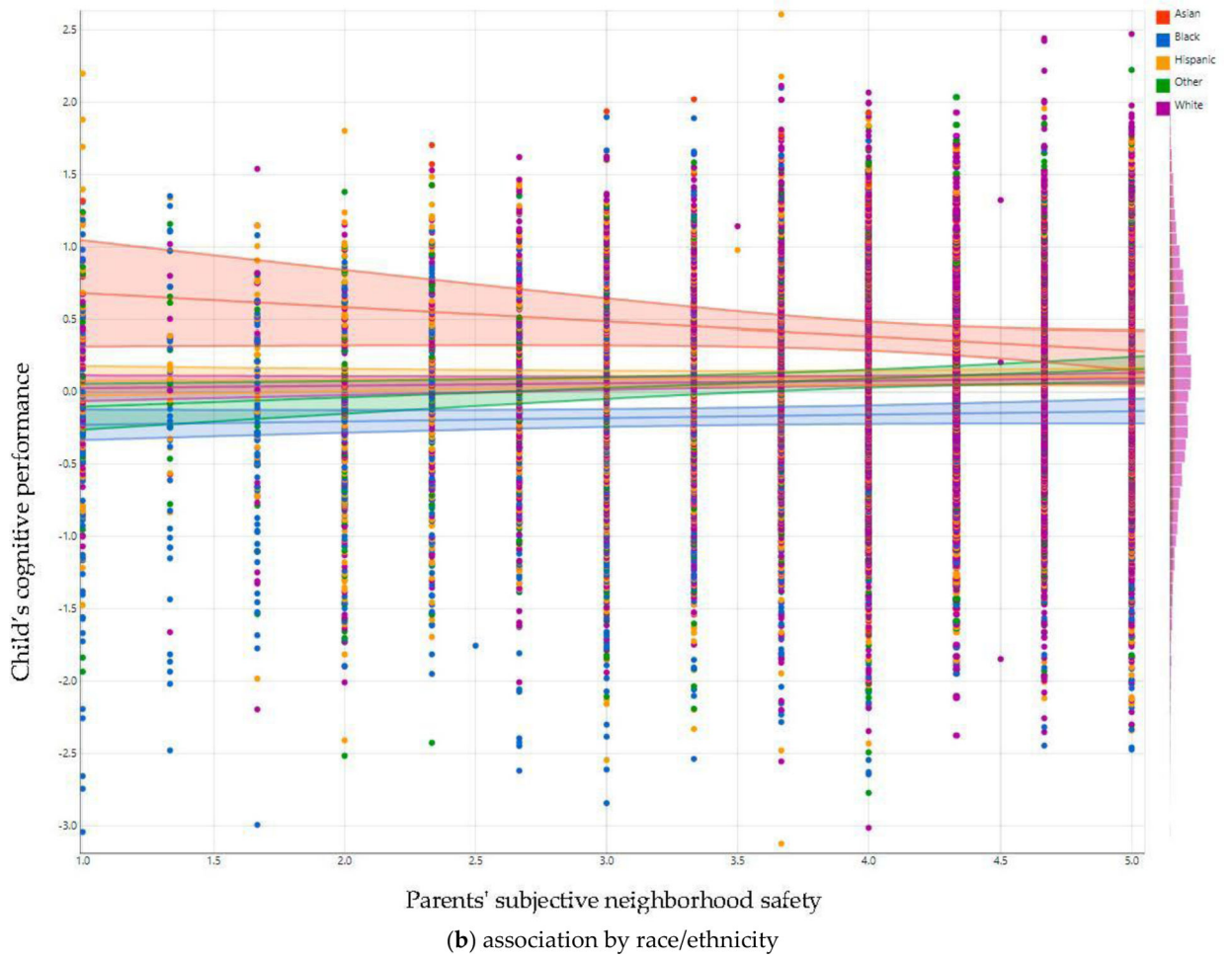
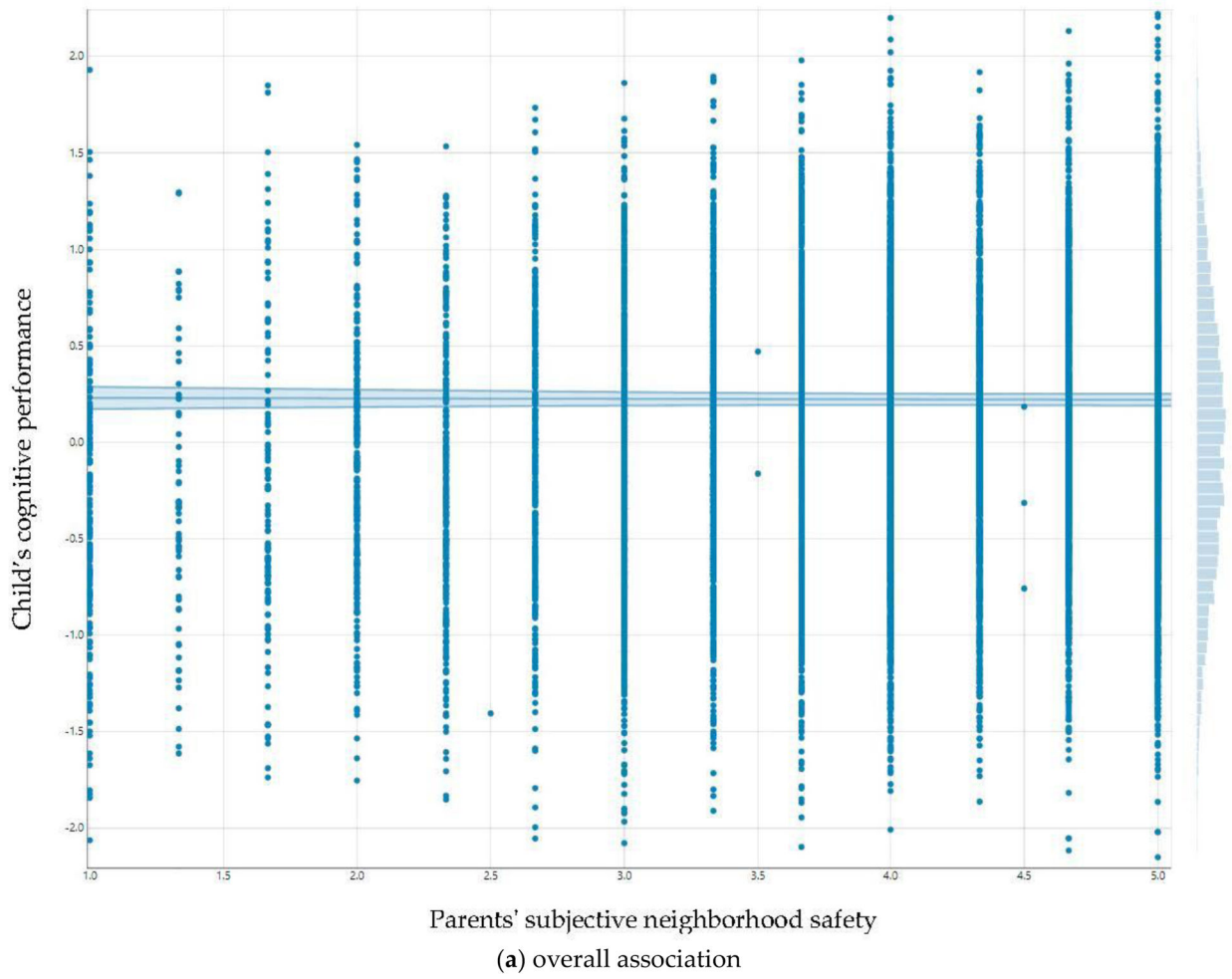


Figure 2. Association between parents' subjective neighborhood safety and children's executive functioning overall and by race/ethnicity.



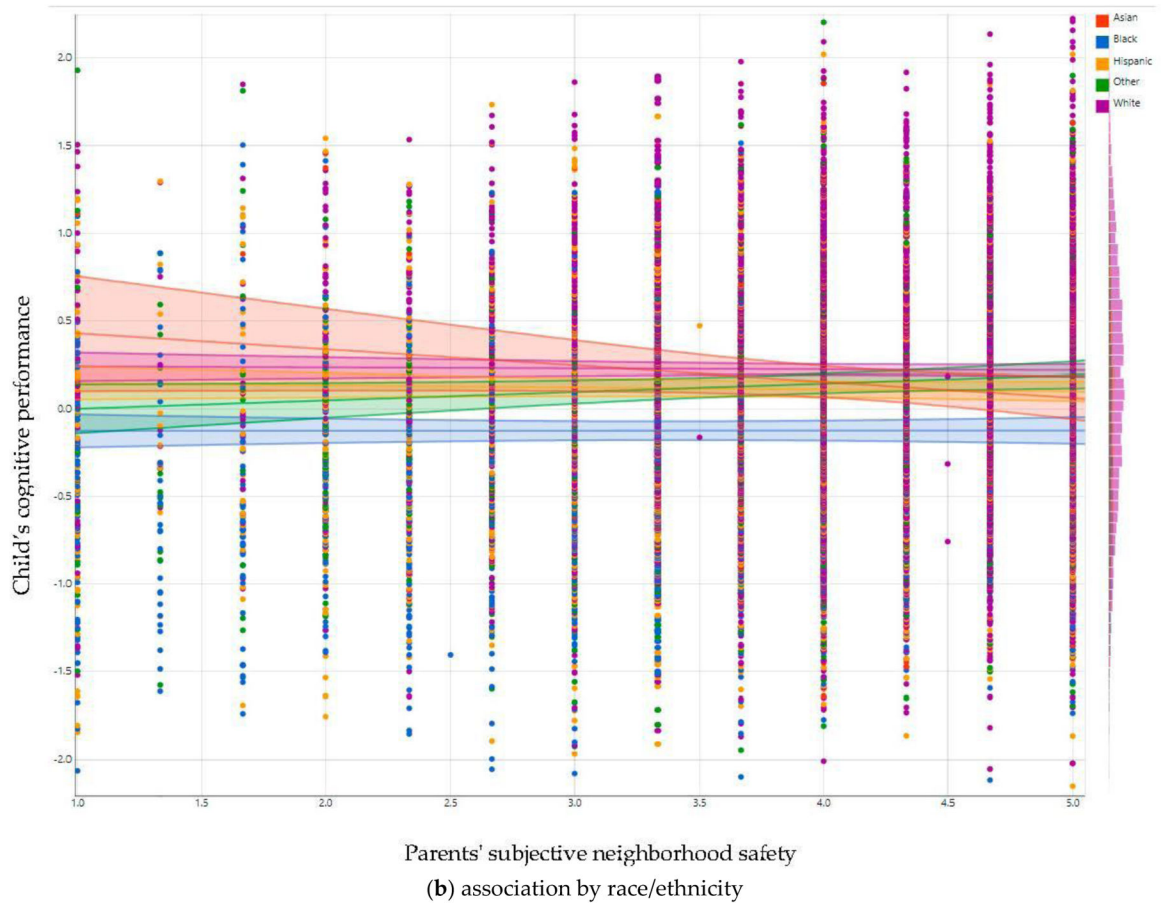


Figure 3. Association between parents' subjective neighborhood safety and children's learning/memory overall and by race/ethnicity.

Table 1.

Descriptive data overall and by race/ethnicity.

Level	Overall	Non-Hispanic White		Non-Hispanic Black		Hispanic		Asian		Other		p	
	n	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted			
	10027		5494		1371		1911		205		1046		
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Age (Month)	118.93 (7.47)	119.20 (7.48)	119.11 (7.51)	119.39 (7.50)	118.97 (7.21)	119.31 (7.21)	118.46 (7.54)	118.66 (7.53)	119.44 (7.81)	119.74 (7.84)	118.72 (7.40)	118.92 (7.43)	0.014
Neighborhood Safety	3.92 (0.95)	3.89 (0.97)	4.15 (0.78)	4.11 (0.81)	3.32 (1.12)	3.26 (1.13)	3.73 (1.02)	3.72 (1.04)	4.10 (0.83)	4.13 (0.80)	3.84 (0.97)	3.72 (1.03)	<0.001
General Cognitive Ability	0.03 (0.77)	-0.02 (0.77)	0.24 (0.69)	0.19 (0.70)	-0.55 (0.71)	-0.60 (0.70)	-0.20 (0.73)	-0.25 (0.73)	0.48 (0.73)	0.43 (0.72)	0.05 (0.77)	-0.13 (0.78)	<0.001
Executive Function	0.01 (0.77)	-0.01 (0.77)	0.07 (0.72)	0.05 (0.73)	-0.28 (0.85)	-0.29 (0.84)	-0.01 (0.76)	-0.03 (0.77)	0.40 (0.74)	0.37 (0.74)	0.04 (0.79)	-0.04 (0.79)	<0.001
Learning and Memory	0.02 (0.70)	-0.01 (0.70)	0.16 (0.67)	0.12 (0.68)	-0.38 (0.64)	-0.39 (0.64)	-0.09 (0.68)	-0.12 (0.68)	0.12 (0.65)	0.12 (0.65)	0.01 (0.70)	-0.06 (0.71)	<0.001
	N (%)	%	N (%)	%	N (%)	%	N (%)	%	N (%)	%	N (%)	%	
Sex													
Female	4821 (48.1)	(49.0)	2595 (47.2)	(48.1)	691 (50.4)	(51.8)	917 (48.0)	(48.7)	106 (51.7)	(52.7)	512 (48.9)	(50.6)	0.204
Male	5206 (51.9)	(51.0)	2899 (52.8)	(51.9)	680 (49.6)	(48.2)	994 (52.0)	(51.3)	99 (48.3)	(47.3)	534 (51.1)	(49.4)	
Parental Education													
<HS Diploma	384 (3.8)	(4.8)	25 (0.5)	(0.9)	105 (7.7)	(9.1)	226 (11.8)	(12.7)	3 (1.5)	(2.1)	25 (2.4)	(4.3)	<0.001
HS Diploma/GED	838 (8.4)	(10.0)	165 (3.0)	(4.3)	311 (22.7)	(25.0)	292 (15.3)	(16.7)	1 (0.5)	(0.7)	69 (6.6)	(11.4)	
Some College	2557 (25.5)	(29.7)	1021 (18.6)	(24.2)	550 (40.1)	(42.1)	655 (34.3)	(37.1)	13 (6.3)	(7.4)	318 (30.4)	(38.6)	
Bachelor	2654 (26.5)	(25.0)	1740 (31.7)	(30.6)	204 (14.9)	(13.0)	365 (19.1)	(17.8)	60 (29.3)	(29.5)	285 (27.2)	(23.3)	
Post Graduate Degree	3594 (35.8)	(30.5)	2543 (46.3)	(40.0)	201 (14.7)	(10.8)	373 (19.5)	(15.6)	128 (62.4)	(60.2)	349 (33.4)	(22.4)	
Married Family													
No	3040 (30.3)	(37.2)	933 (17.0)	(24.7)	960 (70.0)	(76.8)	769 (40.2)	(47.4)	24 (11.7)	(13.6)	354 (33.8)	(44.8)	<0.001
Yes	6987 (69.7)	(62.8)	4561 (83.0)	(75.3)	411 (30.0)	(23.2)	1142 (59.8)	(52.6)	181 (88.3)	(86.4)	692 (66.2)	(55.2)	
Household income													
<50 K	2898 (28.9)	(38.2)	688 (12.5)	(21.4)	911 (66.4)	(75.3)	932 (48.8)	(59.5)	25 (12.2)	(16.6)	342 (32.7)	(48.1)	<0.001
50 K and <100 K	2852 (28.4)	(31.3)	1669 (30.4)	(35.8)	301 (22.0)	(18.8)	572 (29.9)	(28.1)	48 (23.4)	(30.3)	262 (25.0)	(27.8)	
100 K	4277 (42.7)	(30.5)	3137 (57.1)	(42.8)	159 (11.6)	(5.9)	407 (21.3)	(12.3)	132 (64.4)	(53.1)	442 (42.3)	(24.2)	

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Table 2.

Model fit.

	General Cognitive Function		Executive Function		Learning and Memory	
	Model 1 Main Effects	Model 2 M1 + Interactions	Model 1 Main Effects	Model 2 M1 + Interactions	Model 1 Main Effects	Model 2 M1 + Interactions
N	10027	10027	10027	10027	10027	10027
R-squared	0.29873	0.29954	0.09788	0.09859	0.11803	0.11876
R-squared	5×10^{-5} (0%)	0.03602 (3.6%)	0.00042 (0.04%)	0.01538 (1.54%)	1×10^{-5} (0%)	0.02102 (2.1%)

M1: Model 1.

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Table 3.

Summary of mixed-effects regressions on the association between parent's neighborhood safety and children's cognitive performance (general cognition) overall and by race/ethnicity.

	B	SE	p	Sig	B	SE	p	Sig
	Model 1				Model 2			
Neighborhood safety	-0.00536	0.00754	0.47728		-0.02563	0.01144	0.0250715	*
Race ethnicity (Black)	-0.44009	0.02391	<0.001	***	-0.52985	0.07516	<0.001	***
Race ethnicity (Hispanic)	-0.16041	0.01937	<0.001	***	-0.26985	0.07232	0.0001917	***
Race ethnicity (Asian)	0.12400	0.04341	0.0042891	**	-0.00222	0.21712	0.9918262	
Race ethnicity (Other)	-0.09983	0.02547	<0.001	***	-0.42761	0.10071	<0.001	***
Parental education (HS Diploma/GED)	0.23079	0.04070	<0.001	***	0.22886	0.04070	<0.001	***
Parental education (Some College)	0.41625	0.03699	<0.001	***	0.41515	0.03702	<0.001	***
Parental education (Bachelor)	0.58828	0.03949	<0.001	***	0.58631	0.03953	<0.001	***
Parental education (Post Graduate Degree)	0.76372	0.04015	<0.001	***	0.76006	0.04020	<0.001	***
Household income (100 K)	0.23102	0.02386	<0.001	***	0.23030	0.02386	<0.001	***
Household income (50 K and <100 K)	0.15282	0.02085	<0.001	***	0.15024	0.02087	<0.001	***
Married Family	0.04128	0.01775	0.020067	*	0.04012	0.01776	0.0239079	*
Age (Month)	0.02517	0.00076	<0.001	***	0.02514	0.00076	<0.001	***
Sex (Male)	0.05630	0.01220	<0.001	***	0.05653	0.01221	<0.001	***
Race ethnicity (Black) × Neighborhood safety	-	-	-	-	0.02140	0.01992	0.2829265	
Race ethnicity (Hispanic) × Neighborhood safety	-	-	-	-	0.02678	0.01789	0.1344755	
Race ethnicity (Asian) × Neighborhood safety	-	-	-	-	0.03097	0.05139	0.5467362	
Race ethnicity (Other) × Neighborhood safety	-	-	-	-	0.08468	0.02526	0.000806	***

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$.

Table 4.

Summary of mixed-effects regressions on the association between parent’s neighborhood safety and children’s cognitive performance (executive functioning) overall and by race/ethnicity.

	B	SE	p	Sig	B	SE	p	Sig
	Model 1				Model 2			
Neighborhood safety	0.01774	0.00863	0.0398902	*	0.01715	0.01311	0.1908813	
Race ethnicity (Black)	-0.23662	0.02729	<0.001	***	-0.25957	0.08593	0.0025272	**
Race ethnicity (Hispanic)	0.02423	0.02203	0.271353		0.06024	0.08296	0.467719	
Race ethnicity (Asian)	0.29020	0.04903	<0.001	***	0.76695	0.24729	0.0019313	**
Race ethnicity (Other)	0.00446	0.02950	0.8797325		-0.17563	0.11644	0.1314854	
Parental education (HS Diploma/GED)	-0.06608	0.04603	0.1511709		-0.06552	0.04606	0.1548897	
Parental education (Some College)	0.00054	0.04181	0.9897057		0.00219	0.04187	0.9582504	
Parental education (Bachelor)	0.05473	0.04467	0.2205843		0.05494	0.04473	0.2194424	
Parental education (Post Graduate Degree)	0.07775	0.04544	0.0870891	#	0.07855	0.04551	0.0843971	#
Household income (100 K)	0.12898	0.02713	<0.001	***	0.12763	0.02714	<0.001	***
Household income (50 K and <100 K)	0.09244	0.02364	<0.001	***	0.09191	0.02367	0.0001036	***
Married Family	-0.00691	0.02012	0.731316		-0.00834	0.02014	0.6786625	
Age (Month)	0.02290	0.00090	<0.001	***	0.02291	0.00090	<0.001	***
Sex (Male)	-0.06641	0.01425	<0.001	***	-0.06553	0.01425	<0.001	***
Race ethnicity (Black) × Neighborhood safety	-	-	-	-	0.00635	0.02280	0.7806586	
Race ethnicity (Hispanic) × Neighborhood safety	-	-	-	-	-0.01003	0.02054	0.6253109	
Race ethnicity (Asian) × Neighborhood safety	-	-	-	-	-0.11508	0.05863	0.0496991	*
Race ethnicity (Other) × Neighborhood safety	-	-	-	-	0.04749	0.02927	0.1046771	

$p < 0.1$,

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$.

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Table 5.

Summary of mixed-effects regressions on the association between parent’s neighborhood safety and children’s cognitive performance (learning and memory) overall and by race/ethnicity.

	B	SE	t	p	Sig	B	SE	t	p	Sig
	Model 1					Model 2				
Neighborhood safety	-0.00240	0.00767	-0.31	0.7542138		-0.00501	0.01164	-0.43	0.6672876	
Race ethnicity (Black)	-0.34615	0.02434	-14.22	<0.001	***	-0.36835	0.07651	-4.81	<0.001	***
Race ethnicity (Hispanic)	-0.10735	0.01971	-5.45	<0.001	***	-0.08510	0.07363	-1.16	0.2477693	
Race ethnicity (Asian)	-0.08212	0.04416	-1.86	0.0629715	#	0.27601	0.22099	1.25	0.2117149	
Race ethnicity (Other)	-0.08833	0.02592	-3.41	0.0006589	***	-0.28939	0.10254	-2.82	0.0047776	**
Parental education (HS Diploma/GED)	0.05842	0.04140	1.41	0.1582436		0.05877	0.04142	1.42	0.1559774	
Parental education (Some College)	0.12629	0.03763	3.36	0.000793	***	0.12785	0.03768	3.39	0.0006932	***
Parental education (Bachelor)	0.22456	0.04018	5.59	<0.001	***	0.22480	0.04023	5.59	<0.001	***
Parental education (Post Graduate Degree)	0.34131	0.04085	8.36	<0.001	***	0.34171	0.04091	8.35	<0.001	***
Household income (100 K)	0.07257	0.02428	2.99	0.0028053	**	0.07119	0.02429	2.93	0.0033801	**
Household income (50 K and <100 K)	0.04901	0.02121	2.31	0.0208966	*	0.04825	0.02124	2.27	0.0231151	*
Married Family	0.08475	0.01806	4.69	<0.001	***	0.08330	0.01807	4.61	<0.001	***
Age (Month)	0.01108	0.00077	14.33	<0.001	***	0.01108	0.00077	14.33	<0.001	***
Sex (Male)	-0.11215	0.01243	-9.03	<0.001	***	-0.11146	0.01243	-8.97	<0.001	***
Race ethnicity (Black) × Neighborhood safety	-	-	-	-	-	0.00555	0.02028	0.27	0.784387	
Race ethnicity (Hispanic) × Neighborhood safety	-	-	-	-	-	-0.00658	0.01821	-0.36	0.7181036	
Race ethnicity (Asian) × Neighborhood safety	-	-	-	-	-	-0.08618	0.05231	-1.65	0.0995021	#
Race ethnicity (Other) × Neighborhood safety	-	-	-	-	-	0.05275	0.02572	2.05	0.0403252	*

$p < 0.1$,

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$.