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Student-Teacher Ethnoracial Matching in the Earliest Grades: Benefits for Executive Function Skills

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The benefits of student-teacher ethnoracial matching on student outcomes—ranging from academic achievement to postsecondary attainment—are well documented. Yet, we know far less about the role of student-teacher ethnoracial matching in the earliest grades school and on less about effects on non-academic outcomes. The purpose of this study is to advance our understanding of student-teacher ethnoracial matching in early elementary school by exploring two executive function outcomes – working memory and cognitive flexibility. Drawing on data from the Early Childhood Longitudinal Study – Kindergarten Class of 2011, our findings suggest student-teacher ethnoracial matching benefits on working memory skills, though not cognitive flexibility. Observed associations for working memory are of similar size to those for academic achievement outcomes and are largest for Black and Latinx students.

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Abstract

The benefits of student-teacher ethnoracial matching on student outcomes—ranging from academic achievement to postsecondary attainment—are well documented. Yet, we know far less about the role of student-teacher ethnoracial matching in the earliest grades school and on less about effects on non-academic outcomes. The purpose of this study is to advance our understanding of student-teacher ethnoracial matching in early elementary school by exploring two executive function outcomes – working memory and cognitive flexibility. Drawing on data from the Early Childhood Longitudinal Study – Kindergarten Class of 2011, our findings suggest student-teacher ethnoracial matching benefits on working memory skills, though not cognitive flexibility. Observed associations for working memory are of similar size to those for academic achievement outcomes and are largest for Black and Latinx students.

Keywords: student-teacher race and ethnicity match; ethnoracial match; teacher diversity; executive function; elementary school; demographic match; ECLS-K: 2011; race/ethnicity

Student-Teacher Ethnoracial Matching in the Earliest Grades: Benefits for Executive Function Skills?

The academic benefits of student-teacher ethnoracial matching on academic outcomes are well documented (Gershenson et al., 2021; Redding, 2019). Experimental evidence from Tennessee, for example, finds that Black students randomly assigned to a Black teacher in elementary school demonstrate stronger math and reading skills, are more likely to graduate from high school, and are more likely to enroll in college (Gershenson et al., 2018; Dee, 2004). In response to findings such as these, there has been a push from researchers, policymakers, and advocates to enact reforms that (1) increase the diversity of the teacher workforce, (2) increase student assignments to teachers of color, and (3) improve teacher skills in working with students of all backgrounds (Gershenson et al., 2021). Current reforms underway include President Biden's Executive Order "ensuring that all Black students have access to […] diverse teachers and school leaders and other professionals who understand students' lived experiences and can effectively meet their learning, social, and emotional needs" (White House, 2021).

Although this literature is robust in terms of academic achievement and other long-term academic outcomes, the literature on the benefits of student-teacher ethnoracial matching remains underdeveloped in the earliest grades and for non-academic outcomes. This is a key gap in our understanding of the importance of student-teacher ethnoracial matching. Even though schools are academic institutions, they also play important roles in shaping children's non-academic skills, including executive function (EF) (Little, 2016; Diamond & Lee, 2011). To fill in these gaps in knowledge, we draw upon data from the nationally representative Early Childhood Longitudinal Study- Kindergarten Class of 2010-11 (ECLS-K:2011) to address the following three research questions:

Research Question 1: Do students in kindergarten and first grade who have an ethnoracial match with their teachers demonstrate higher working memory and cognitive flexibility skills?

Research Question 2: Do the benefits of ethnoracial matching vary between Black, Latinx, and Asian students?

Research Question 3: How do the findings for students' EF outcomes compare with measures of reading and math achievement?

Using our preferred student-fixed effects estimation approach, we find benefits of student-teacher ethnoracial matching in terms of working memory but not cognitive flexibility. We also find that: (a) the benefits for working memory are most pronounced for Black and Latinx students; and (b) associations for EF are similar in magnitude to reading and math achievement, which we explored in this study in order to make comparisons with our EF outcomes.

In the next section, we provide further background on the ethnoracial matching and EF literatures and present our conceptual framework. We then detail our methodological approach and results. In the final section, we explore the implications of our findings in the areas of research, policy, and practice. We pay particular attention to how this research contributes to discussions about advancing educational equity.

Student-Teacher Ethnoracial Match and Student Outcomes

Most of the literature on student-teacher ethnoracial matching has focused on the achievement benefits of these matches (Redding, 2019). Furthermore, most of this literature has focused on the third grade and higher, since it is in grades three and higher where state test scores become available. Due to this data constraint, an extremely limited body of work has focused on

matching in the “early grades”, which we define as those prior to the third grade. For instance, Gottfried et al. (2019) compared ethnoracial matching benefits on a range of outcomes between kindergartners with and without disabilities. Yet, they found no benefits of match on academic achievement outcomes. Banerjee (2017) drew on the same dataset and examined the link between ethnorcial match and placement in ability groups in the early grades. The author found that Latinx students were more likely to be placed in higher ability groups when assigned to a Latinx teacher in first grade.

Consistent with studies on academic outcomes, research on non-academic outcomes is concentrated in higher grades. Studies have explored the benefits of student-teacher ethnorcial match on a wide variety of non-academic outcomes, ranging from absenteeism (Gottfried et al., 2021; Tran & Gershenson, 2021) to student attitudes, including happiness and motivation (Egalite & Kisida, 2017). The analysis from Tran and Gershenson (2021), for example, found that when Black students were randomly assigned to Black teachers, the probability of the student being chronically absent was reduced by 26 percent. Gottfried and colleagues (2021) found that Latinx students with Latinx teachers had fewer missed school days in high school. Hence, evidence is certainly being amassed that ethnoracial matching matters for different student groups across non-testing outcomes. However, limiting our search to studies focused in the early grades, there is far less research in this area.

For example, a study from Wright et al. (2017) examined ethnoracial matching in kindergarten and found only limited evidence of benefits on a range of social-emotional outcomes. These results corroborated a study by Jennings and DiPrete (2010) that found limited evidence of benefits of ethnoracial match on similar outcomes. With speculation, the limited findings here might have arisen given that social-emotional outcomes rely on subjective teacher-

rated ratings of children and thus may differ as such. A key benefit of the present study is that we rely on direct-assessment measures of EF, which overcomes this limitation associated with teacher-reported measures of non-testing skills.

Prior to elementary school, we are aware of only two studies focused on ethnoracial matching in early childhood settings, such as prekindergarten. Drawing on Head Start FACES data, Markowitz and colleagues (2020) found that student-teacher ethnoracial match in Head Start was associated with higher levels of parental engagement and fewer absences, particularly among Latinx families. In another study, Downer and colleagues (2016) used a dataset that included data from Pre-K programs in 11 different states and found benefits of student-teacher ethnoracial matching on assessment measures of academic skills for Latinx children, but not for Black children.

To summarize, the literature on student-teacher ethnoracial matching is robust in terms of academic outcomes and in the tested grades (third grade and beyond). In the present study we sought to understand the outcomes of ethnoracial matching in the early grades, particularly in the context of non-academic outcomes. The literature in this area is sparse and indicates the necessity of studies like the present one. Although others have examined non-academic skills in the early grades, the outcomes examined were limited by being teacher-reported. Yet, what this limited literature does suggest is that student-teacher ethnoracial matching can matter in the early grades, but there is nuance based on outcomes that needs to be more thoroughly unpacked.

Importance of Executive Function Skills

Missing from the student-teacher ethnoracial matching conversation is a focus on children's EF skills. These EF skills, which help children engage in goal-directed behavior, have become a prominent area of scholarly interest in recent years (Little, 2016, 2021; Diamond &

Lee, 2011). EF skills are comprised of three components: (1) *working memory*, which is the ability to hold and process information in our mind; (2) *cognitive flexibility*, which is the ability to change your attention and perspectives; and (3) *inhibitory control*, which is the ability to stay focused on tasks when distracted.

Part of the growing interest in these skills is due to the consistent finding that higher EF skills predict academic success (Best et al., 2011, Ursache et al., 2012). Yet, like academic outcomes, there are stark differences in EF skills based on race/ethnicity and socioeconomic status. For example, Little (2017) found that Black and Latinx students entered kindergarten approximately 0.5 standard deviations behind their white peers on the two measures of EF, which we include in the present study. It is in this context that efforts to promote EF skills and address inequalities therein have expanded. Research has shown that EF skills are malleable, particularly during early childhood and the early grades, and school-based interventions and experiences can shape EF developmental trajectories (Little, 2016; Diamond & Lee, 2011; Morrison et al., 2009). All of these factors suggest that EF skills may be an outcome particularly susceptible to change in the context of student-teacher ethnoracial matches.

Conceptual Framework

Our review of the literature thus far has focused on the effects of ethnoracial matching on student outcomes, but not on potential explanations for *how* and *why* matches may be beneficial for student outcomes, particularly for EF skills. There are three primary schools of thought on how and why ethnoracially-similar teachers matter for student outcomes (Gershenson et al., 2021). The first focuses on the beliefs, expectations, and biases of teachers. In this perspective, what a teacher believes about certain groups of students can alter how they deliver instruction, interact with parents, and grade papers, for example. This perspective could play out with a non-

matched teacher not accurately recognizing the skill or developmental level of a student of color and thus not providing appropriate levels of scaffolded instruction, which has been linked to improvements in EFs in addition to academic achievement, for example (Meltzer, 2010).

The second perspective focuses on the specific teaching practices and approaches that teachers of color are more likely to exhibit that benefit students of color. Researchers have found that when teachers of color provide culturally relevant pedagogy, they are able to better connect with students whose culture and experiences are often not reflected in standard school curricula and approaches (e.g., Ladson-Billings, 1995). For example, recent scholarship has found that EF skills develop differentially based on cultural experiences, which opens the door for student-teacher match to optimize EF development via culturally relevant instructional practices (e.g., Legare et al., 2018). Alternatively, matches may generate increased parental engagement with the teacher that, in turn, supports parental practices that enhance EFs (Wilson & Gross, 2018; Vinopal, 2018).

The last perspective is about teachers of color serving as role models for students of color. Such a "role model effect" operates when students of color perform differently when they have a teacher of color at the head of the classroom, even if they do not employ any different teaching practices than white teachers. Such a mechanism may boost the engagement levels of students experiencing an ethnoraical match via a combination of fewer absences, more time spent on task, and fewer problem behaviors. Higher levels of engagement due to role modeling would increase the likelihood that students benefit from instructional practices and curricula that promote EF skills. Note that these three explanatory perspectives for matching effects are not mutually exclusive. For example, students of color may benefit from role model teachers who are also engaging in more culturally relevant pedagogical practices

Because our study is designed to examine the link between student-teacher ethnoracial match and EF skills, we cannot specifically test which of these mechanisms may yield observed associations. However, merging these theoretical explanations with insights from the EF literature suggests that these mechanisms may plausibly generate improved EF skills for students in the context of ethnoracial matches with teachers.

Method

Dataset

We used data from the Early Childhood Longitudinal Study – Kindergarten Class of 2010-11 (ECLS-K:2011), which was compiled by the National Center for Education Statistics (NCES) at the U.S. Department of Education. The ECLS-K:2011 was created to follow a nationally representative cohort of kindergartners in the 2010-11 school year through elementary school. Information was collected about this cohort of children and their families through direct assessments as well as through surveys of families, teachers, and school administrators. Details about the creation and compilation of this dataset as well as survey instruments are publicly available on the U.S. Department of Education website (https://nces.ed.gov/ecls/).

EF measures were only available in the identical format in kindergarten and first grade. Hence, our sample is restricted to these first two years, and consequently our analysis plan follows the work of Cho (2012) who also used kindergarten and first grade ECLS-K samples. The sample in kindergarten included 18,170 children. We arrived at this final analytic sample with multiple imputation (Royston, 2004). Specifically, we imputed 20 datasets for the child observations for which there were nonzero weights. Sample weights were provided in the dataset by NCES. The weights were employed in both the imputation and in all analyses.

Measures

Achievement. As mentioned above, while this study focuses on EF outcomes, we do run all models with achievement scores as outcomes in order to make comparisons. The NCES assessed children's reading and math achievement scores based on assessments that they had developed (α = .92–.95). The questions on the reading assessment pertained to print familiarity, letter recognition, and recognition of common words. Questions on the math assessment pertained to number sense, properties, and operations, measurement, geometry and spatial sense, data analysis, and patterns, algebra, and functions.

Executive function. NCES included two measures of EF, namely cognitive flexibility and working memory (Tourangeau et al., 2015). Cognitive flexibility assesses a child's ability to switch between thinking about different concepts and was measured with the Dimensional Change Card Sort (α= .90–.94; DCCS; Zelazo, 2006). The DCCS score reflects a child's performance over a series of tests associated with accuracy on card sorting tasks (i.e., by shape, color, and border games). Working memory assesses a child's ability to store and manage information during complex cognitive tasks and was measured with the Numbers Reversed subtest of the Woodcock-Johnson (α = .87; Woodcock et al., 2001). During this assessment, children were asked to repeat a series of numbers that were dictated to the child. If a child responded incorrectly, then the task ended. If children responded correctly to the task, then the number span increased by one digit at a time.

Student-Teacher Ethnoracial Match. Our key independent variable was whether a child had a teacher of the same race or ethnicity. The ECLS-K:2011 provided racial and ethnic demographic information for both student and teacher in the categories of White, Black, Latinx, Asian, Native American, or Native Hawaiian/Pacific Islander. Because of small sample size, Native American and Native Hawaiian/Pacific Islander (less than 1.5% of the student and teacher

samples) were removed from the study sample. Thus, we focused on, ethnoracial matches for White, Black, Latinx, and Asian students.

Table 1 presents ethnoracial matching in the dataset in kindergarten and first, grade. There are two important points to note. First, even though White children had the highest proportion of ethnoracial mathes, there were instances across all racial and ethnic groups of students having the same race or ethnicity teacher. Second, for Black, Latinx, and Asian American children, the rates of same race or ethnicity teacher matching stayed consistent over the two years in the study. In contrast, White children were less likely to have a same race or ethnicity match in first grade compared to kindergarten.

Control variables. Table 2 presents the control variables used in this study, broken into child, family, and classroom and teacher characteristics. In Table 2, means and standard deviations are displayed at baseline – i.e., when the students were in kindergarten. That said, we have repeated measures on the child for kindergarten and first grade.

Child characteristics. We employed a standard set of demographic variables, which included biological sex, race and ethnicity, health rated by parents (1 out of 5, 1 highest), English language learner status, and disability status. We also included early care and education experiences, such as whether the child attended prekindergarten the year before kindergarten, whether the child was in a full-day kindergarten program, and whether the child was in care before or after school during kindergarten. Finally, we included the number of absences per year, as reported by the teacher.

Family characteristics. Next, we included characteristics pertaining to the household structure, such as having two parents in the home and number of siblings. We also included measures of family school choice, namely whether the family chose the school for the child (as

opposed to attending the neighborhood school) and whether the family chose their house location for the school the child attended. Finally, we included measures pertaining to families' socioeconomic status, namely: Education, employment, and poverty status.

Classroom characteristics. In each year, teachers reported on the characteristics of each child's classroom. To begin, this included classroom size. Based on classroom size as well as the counts of children by demographics, we were able to include the following percentages in our models: Percent girls, Black, Latinx, Asian, performing below grade level in reading and in math, with a disability, and English Language Learner.

Teacher characteristics. Finally, we included information on race or ethnicity, years of experience, and degree attainment of teachers.

Analysis Plan

As mentioned above, our analysis plan follows Cho (2012), who relied on kindergarten and first grade waves of the ECLS-K database in her analyses. We have adapted her analysis plan to fit our research questions.

Baseline model. To begin, we relied on the following baseline model:

$$Y_{ist} = \beta_1 SRE_{ist} + \beta_2 C_{ist} + \beta_3 F_{ist} + \beta_4 C_{it} + \beta_5 T_{st} + \varepsilon_{ist}$$

where Y represents a spring semester outcome for child *i* in school *s* in year *t*. Our key variable in the equation is SRE, whether a student has a teacher of the same race or ethnicity. Our control variables are represented in the equation as C (child), F (family), C (classroom), and T (teacher) characteristics, all displayed in Table 2. In this model, standard errors were clustered by teacher-year to account for correlated errors of students within classrooms. Note that all models include indicators for wave to control for year-specific factors. Additionally, all models include a one-

wave lagged measure of the outcome (kindergarten's lagged outcome is measured just at kindergarten entry rather than in the prior year).

School fixed effects. One issue with the baseline model is that some parents might choose to send their children to specific schools where there is a greater chance of their children having a teacher with the same race or ethnicity. One might hypothesize that these same parents are making other investments to improve their children's outcomes. Or it might be the case that some principals might be more involved in hiring a diverse teaching workforce as one of the many ways that principals might be trying to improve student outcomes. These are just some of the ways that the estimates of β1 in the baseline model might be biased as a result of not accounting for unobserved school-to-school differences.

To address this issue, we compared students only to other students in the same school. To do so, we added in school fixed effects to the model:

$$Y_{ist} = \beta_1 SRE_{ist} + \beta_2 C_{ist} + \beta_3 F_{ist} + \beta_4 C_{it} + \beta_5 T_{st} + \delta_s + \varepsilon_{ist}$$

where δ_s represents indicator variables for school. School fixed effects were an important test of robustness in that, we control for unobserved school-level factors. These include, but are not limited to, leadership, parental involvement, school sorting, and so forth. Hence, the primary source of variation occurred within schools and between classrooms.

Student fixed effects. A key issue not addressed by school fixed effects is unobserved individual-level heterogeneity that might have been influencing both the chance of having a student-teacher ethnoracial match as well as improvements in outcomes Y. As one example, principals might sort children within schools to have a teacher of the same race or ethnicity. Or, principals might do the reverse as a way to expose more children to teachers of different races or ethnicities. It was not possible to distinguish student-to-classroom assignment policies or

practices within schools. But with the ECLS-K:2011,it was possible to address this issue because there are repeated observations on the same student. Hence, we employed a student fixed effects model, as follows:

$$Y_{ist} = \beta_1 SRE_{ist} + \beta_2 X_{ist} + \delta_i + \varepsilon_{ist.}$$

In this model, δ_i represents student fixed effects – an indicator variable for each student ID in the dataset. The term X represents all time-varying variables from C, F, C, and T in previous models, such as moving in and out of poverty status or rating of child health. All time-invariant variables, such as having attended full-day kindergarten, were dropped from the model.

The reason behind this specification is that student fixed effects compared the same individual child across years of the dataset. In this way, it was possible to compare the student to himself or herself in different years, during which in some years the student had an ethnoracial match with the teacher and in other years did not. That is, student fixed effects relied on within-student variation in our key variable SRE, and essentially, each student becomes his or her own comparison group. Both observed and unobserved time-invariant characteristics remain fixed, which allowed us to best isolate the associations between having a student-teacher ethnoracial match and students' academic and EF skills.

Results

Achievement

We began our analyses by looking at achievement outcomes, so that we can make comparisons to EF outcomes further down. Table 3 presents findings for reading and math achievement outcomes based on having a student-teacher ethnoracial match as well as the set of control variables. Coefficients are presented with cluster-adjusted standard errors in parentheses. Recall that all models also contained indicators for year as well as a lagged measure of the

outcome. Our findings suggest that when students have an ethnoracial match with their teacher, their reading and math achievement scores are higher. This pattern is evident across the first row of Table 3. Importantly, even after accounting for a host of control variables as well as school fixed effects, an ethnoracial student-teacher match is associated with higher academic test scores. Even in our most robust student fixed effects model, the ethnoracial match coefficient is statistically significant and corresponds to an effect size of approximately 0.09σ for reading and 0.06σ for math. This latter finding is important, as student fixed effects rely entirely on within-student variation, thereby accounting for unobserved individual level time-invariant heterogeneity.

Executive Function

Table 4 presents the findings for the two EF outcomes. Much like in Table 3, the findings are for the entire sample – with baseline, school fixed effects, and student fixed effects models presented for each outcome. For cognitive flexibility, although the coefficient on having a student-teacher ethnoracial match is statistically significant in the baseline and school fixed effects models, it is no longer significant in the student fixed effects model. This is important, as this final model not only takes advantage of repeated measures but also controls for unobserved individual differences and within-school sorting. Thus, in our most robust model, there is no evidence that having a student-teacher match predicted differences in this measure of cognitive flexibility.

On the other hand, in the context of an ethnoracial match, working memory improved – as evidenced by the models under the *W*-Ability section in the baseline, school fixed effects, and student fixed effects models. The effect size is approximately 0.05σ in the student fixed effects model, thereby suggesting consistency with academic outcomes. In fact, the size of the

coefficient is almost similar to that for mathematics in Table 3. This is logical, given the high correlation between the numbers reversed task and the mathematics assessment (Little, 2021). Importantly, the only statistically significant predictor in the student fixed effects model is the ethnoracial match coefficient, which underscores its importance in predicting children's working memory.

Group Differences

With our third research question, we asked whether there were differences in having an ethnoracial match for Black, Latinx, and Asian students specifically. To address this question, we re-ran the student fixed effects models from Tables 3 and 4 for Black, Latinx, and Asian students. Table 5 presents the ethnoracial match coefficients from each of those regressions. For the sake of clarity, only the ethnoracial match coefficients are presented, though all models were analogous to those in the previous tables.

For the academic outcomes, the findings revealed that Black and Latinx (but not Asian) students benefitted from having a same race or ethnicity teacher. For both reading and math, the table clearly shows that Black and Latinx students had higher achievement scores compared to Black and Latinx students who did not have a Black or Latinx teacher, respectively. The effect sizes in reading were approximately the same size as those for the general student models in Table 3 at around 0.08σ. The math effect size was larger for Black students than the general sample in Table 3 – at around 0.08σ, and the Latinx effect size was approximate to the size of that in the general sample.

For EF outcomes, the findings for cognitive flexibility were not surprising, given the null findings in the student fixed effects model in Table 4. As for working memory, Black and Latinx students also benefitted here from having a same race or ethnicity teacher, much like Black and

Latinx students had benefitted in reading and math. Recall that the effect size from Table 4 for working memory was 0.05σ. In contrast, the effect size for Black and Latinx students is greater compared to the general sample and corresponds to 0.15σ, and 0.10σ, respectively.

Discussion

As the population in the United States becomes more racially/ethnically diverse, there has been a push for greater representation of educators of color who are currently underrepresented in schools (Gershenson et al., 2021). Reflecting the importance of ethnoracial representation among educators, a growing body of evidence suggests that children benefit academically from such matches (Gershenson et al., 2021; Lindsay & Hart, 2017; Redding, 2019). With that said, we argued that a key unresolved question is whether having an ethnoracial student-teacher match could influence other key domains of child development.

In this study, we focused specifically on children's EF, which are well-established correlates of long-term educational success and well-being (Willoughby et al., 2019; Best et al., 2011, Ursache et al., 2012). Yet, they have been completely unexplored in the ethnoracial matching literature. To redress these gaps in knowledge as well as provide a better picture of the full extent to which ethnoracial matching supports children, we examined the benefits of matching on an array of outcome domains between kindergarten and first grade for a nationally representative sample of students. Below we discuss the themes that emerged from this work.

To begin, our models point to the same conclusion: Ethnoracial matching positively correlates with students' working memory but not cognitive flexibility in the early elementary school years. Other studies of educational treatments and executive function outcomes using the ECLS-K:2011 have found similar differences between EF measures. For example, Little (2021) examined the link between preschool attendance and EF gains in elementary school. This author

found benefits for working memory but not cognitive flexibility, as we do in the present paper. Little (2021) hypothesized there were three potential explanations for such an observation, which apply here: (1) EF sub-domains are distinct, so we could expect to see differential associations depending on the treatment; (2) the working memory measure is highly correlated with mathematics assessment measure, so the benefits may be through more achievement-related pathways; and (3) students grew more in the ECLS-K:2011 on the working memory assessment than the cognitive flexibility assessment, so there is more variation present. In addition to exploring differences between EF domains, we also explored differences between EF and achievement domains. What these models tell us is that the effect sizes for the EF models were comparable to the effect sizes for the achievement models.

Although the associations of interest may appear small relative to conventional standards, these estimates represent the benefit of one year of having a teacher of the same race/ethnicity. When extrapolated to the population of students at large and across multiple years of schooling, these small yet significant associations can have large effects. Thus, our results add to the substantive evidence that ethnoracial representation among American educators matters by underscoring a key way in which students' non-academic skills are developed in schools. This is a critical step forward as students' working memory, a core component of EF, has been consistently linked to improvements in student achievement (Willoughby et al., 2019) and is most malleable in early childhood (Blair, 2016; Diamond & Lee, 2011). And, just as importantly, there are sizeable differences in these skills based on dimensions of race/ethnicity and socio-economic status (Little, 2016). Accordingly, the underrepresentation of educators of color in the United States represents one contributing factor to the racial/ethnic differences among elementary-aged students' development of academic and EF skills.

Next, examining heterogeneity in racial representation among teachers by student race/ethnicity yielded significant differential associations of ethnoracial matching for the development of working memory among Latinx and Black (but not Asian) students. More specifically, the benefits of race-matching were two to three times larger for Latinx and Black students' development of EF skills relative to the general population of kindergartners and first graders. The larger associations of race-matching for Latinx and Black students' EF development may support the notion that Latinx and Black teachers are better able to support their students' development. Further, if that is true, such a finding implicates promoting ethnoracial matches as a key vehicle for remedying the inequities in EF skills in the early grades (Little, 2016).

Despite these contributions to the literature on student-teacher racial matching in the early elementary school years, there are several limitations of this work that should be acknowledged. First, the data from the ECLS-K:2011 do not allow us to measure the extent to which the differences in students' EF by teacher-race match reflect stereotyping behaviors on the part of teachers from different groups nor the extent to which students change their behavior and classroom engagement in response to their teachers' race/ethnicity. Put another way, although the present study demonstrates the associations between racial matching and student outcomes, we could not test the potential mechanisms through which student-teacher ethnoracial matching shapes the outcomes under investigation. Accordingly, future research should pay more careful attention to the underlying reasons why students do better in the context of race-matching. Such an exploration could provide new insights about both how and why ethnoracial matching matters. Second, although we implemented several methodological specifications - including student fixed effects - to mitigate bias in our analyses, it is likely that we did not account for all time-varying characteristics of students and their experiences that affect their propensity of

having a same-race teacher and their outcomes. As such, caution is warranted when interpreting our findings. Third, although we used a large and nationally representative sample of American kindergartners and first graders, the combination of certain student-teacher groups was small; consequently, the experiences of certain groups could not be examined. With that said, this limitation is likely to be present in any study of student-teacher race match given that the workforce is largely White.

With these limitations and future directions in mind, the present study moved beyond studying the academic outcomes of having a same-race teacher in the early elementary school years (Gershenson et al., 2021; Redding, 2019) by highlighting associations with other key developmental domains. In doing so, our findings advance ongoing conversations regarding the benefits of teacher-student race match by highlighting: (a) significant differences in students' working memory (but not cognitive flexibility) as a function of having a teacher of the same race/ethnicity across the early elementary school years; and (b) that these benefits are most pronounced for Black and Latinx students. As such, diversifying the educator workforce represents a key step toward promoting greater equity in schools across the United States.

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Table 1: Same Race or Ethnicity Matching By Grade

	Kindergarten	1st Grade
Latinx	0.59	0.54
Black	0.24	0.19
Asian	0.13	0.14
White	0.83	0.72

Table 2: Descriptive Statistics at Baseline in Kindergarten (*N* = 18,170)

	Mean	SD
Ethnoracial match with teacher	0.62	*0.50*
Child characteristics		
Male	0.51	*0.50*
Latinx	0.25	*0.44*
Black	0.19	*0.37*
Asian	0.11	*0.31*
Health rating (1 being highest rating)	1.57	*0.79*
English language learner	0.16	*0.34*
Has disability	0.20	*0.37*
Attended prekindergarten	0.54	*0.50*
Attended full-day kindergarten	0.82	*0.38*
In before/after school care during kindergarten	0.88	*0.35*
Absences	5.97	*4.43*
Family characteristics		
Two-partner household	0.75	*0.42*
Number of siblings	1.51	*1.13*
Chose school for child	0.35	*0.47*
Chose house for school	0.67	*0.47*
Mother has at least college degree	0.31	*0.48*
Father has at least college degree	0.28	*0.48*
Mother employed full time	0.42	*0.50*
Father employed full time	0.78	*0.35*
Poverty	0.51	*0.50*
Classroom characteristics		
Class size	20.35	*5.03*
Percent girls	0.49	*0.10*
Percent Black	0.15	*0.14*
Percent Latinx	0.23	*0.17*
Percent Asian	0.05	*0.08*
Percent below grade level in reading	0.18	*0.17*
Percent below grade level in math	0.14	*0.15*
Percent with disability	0.08	*0.13*
Percent English Language Learner	0.08	*0.05*
Teacher characteristics		
Black	0.05	*0.25*
Latinx	0.11	*0.31*
Asian	0.03	*0.17*
Years of experience	14.49	*9.80*
MA degree or higher	0.46	*0.50*

Table 3: Achievement Outcomes

	Reading			Math		
	Baseline Model	School Fixed Effects	Student Fixed Effects	Baseline Model	School Fixed Effects	Student Fixed Effects
Ethnoracial match with teacher	1.36***	1.60***	2.10***	0.95***	1.23***	1.23***
	(0.18)	(0.19)	(0.31)	(0.16)	(0.16)	(0.26)
Child characteristics						
Male	-1.16***	-1.13***		0.83***	0.85***	
	(0.12)	(0.12)		(0.10)	(0.10)	
Latinx	-0.57**	-0.66**		-0.59***	-0.65***	
	(0.20)	(0.20)		(0.15)	(0.16)	
Black	-0.24	0.02		-1.43***	-1.36***	
	(0.24)	(0.27)		(0.19)	(0.20)	
Asian	1.23***	1.41***		0.73***	0.85***	
	(0.28)	(0.30)		(0.22)	(0.22)	
Health rating (1 being highest rating)	-0.33***	-0.29**	-0.04	-0.25***	-0.24**	-0.16
	(0.08)	(0.08)	(0.14)	(0.07)	(0.07)	(0.11)
English language learner	-0.67**	-0.54*	0.72	-0.02	0.03	-0.26
	(0.21)	(0.21)	(0.39)	(0.17)	(0.17)	(0.32)
Has disability	-2.36***	-2.30***	-0.84	-1.80*	-1.75**	-0.63
	(0.19)	(0.16)	(0.36)	(0.24)	(0.21)	(0.30)
Attended prekindergarten	0.05	0.03		-0.14	-0.03	
	(0.28)	(0.20)		(0.16)	(0.13)	
Attended full-day kindergarten	0.11	-0.49		0.08	-0.43	
	(0.24)	(0.56)		(0.16)	(0.29)	
In before/after school care during kindergarten	-0.07	0.05		-0.21	-0.36*	
	(0.26)	(0.30)		(0.18)	(0.16)	
Absences	-0.10***	-0.10***	-0.01	-0.07***	-0.08***	-0.01
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Family characteristics						
Two-partner household	0.59***	0.65***	-0.40	0.23	0.23	-0.34
	(0.16)	(0.16)	(0.42)	(0.13)	(0.13)	(0.31)
Number of siblings	-0.19**	-0.20**	0.12	0.03	0.03	0.35
	(0.06)	(0.06)	(0.50)	(0.05)	(0.05)	(0.44)
Chose school for child	-0.05	-0.20		-0.04	-0.11	
	(0.12)	(0.13)		(0.11)	(0.12)	
Chose house for school	0.26	0.01		0.28*	-0.00	
	(0.18)	(0.24)		(0.13)	(0.15)	
Mother has at least college degree	0.90***	1.01***	1.43	0.58***	0.72***	0.53
	(0.16)	(0.17)	(1.87)	(0.14)	(0.14)	(0.93)
Father has at least college degree	0.75***	0.83***	-1.98	0.63***	0.64***	-0.41
	(0.17)	(0.19)	(1.44)	(0.13)	(0.14)	(1.30)
Mother employed full time	0.03	-0.01	-0.16	0.05	0.06	-0.07
	(0.20)	(0.21)	(0.37)	(0.11)	(0.11)	(0.20)
Father employed full time	0.36*	0.43*	0.22	0.17	0.25	0.45
	(0.17)	(0.19)	(0.40)	(0.18)	(0.17)	(0.28)
Poverty	-0.66*	-0.76**	-0.05	-0.30*	-0.44***	0.32
	(0.20)	(0.18)	(0.41)	(0.13)	(0.13)	(0.39)
Classroom characteristics						
Class size	-0.04*	-0.03	-0.02	-0.02	-0.00	-0.01
	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Percent girls	1.13	-0.04	0.14	0.11	-0.06	1.36
	(0.86)	(1.14)	(1.44)	(0.64)	(0.80)	(1.06)
Percent Black	-0.80	-0.02	1.08	-0.60	0.71	-1.14
	(0.42)	(0.83)	(1.18)	(0.35)	(0.77)	(0.96)
Percent Latinx	-0.84*	-1.25	-0.04	-0.90*	-0.35	-0.24
	(0.40)	(0.93)	(1.14)	(0.38)	(0.71)	(0.90)
Percent Asian	-0.34	0.71	3.34	-0.61	0.13	0.91
	(0.72)	(1.05)	(2.13)	(0.63)	(0.94)	(1.41)
Percent below grade level in reading	-5.06*	-4.56***	-5.33***	-3.44*	-3.72**	-3.45***
	(1.06)	(0.83)	(0.86)	(0.79)	(0.76)	(0.70)
Percent below grade level in math	-1.81*	-2.17**	-0.63	-0.28	-0.52	-0.23
	(0.80)	(0.79)	(1.02)	(0.84)	(0.77)	(0.74)
Percent with disability	-1.92*	-1.79*	-1.34	-2.12**	-2.43***	-1.00
	(0.78)	(0.84)	(1.18)	(0.67)	(0.74)	(0.88)
Percent English Language Learner	-6.05**	-6.71*	-0.96	-4.71**	-3.86	3.39
	(2.06)	(2.78)	(3.07)	(1.68)	(2.46)	(3.11)
Teacher characteristics						
Black	-0.64	-0.05	0.36	-0.39	-0.10	0.27
	(0.42)	(0.38)	(0.43)	(0.30)	(0.32)	(0.35)
Latinx	-0.85**	-0.55	0.29	-0.81*	-0.35	-0.31
	(0.29)	(0.32)	(0.44)	(0.30)	(0.39)	(0.33)
Asian	-0.95	-0.45	-0.55	0.14	0.66	0.56
	(0.56)	(0.66)	(0.80)	(0.50)	(0.51)	(0.75)
Years of experience	-0.00	0.01	0.00	-0.02	-0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
MA degree or higher	0.01	-0.07	0.22	0.15	-0.01	0.06
	(0.16)	(0.18)	(0.20)	(0.13)	(0.15)	(0.16)
n	30,154	30,154	30,154	30,042	30,042	30,042

*Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.*

Table 4: Executive Function Outcomes

	DCCS			W Ability		
	Baseline Model	School Fixed Effects	Student Fixed Effects	Baseline Model	School Fixed Effects	Student Fixed Effects
Ethnoracial match with teacher	0.08*	0.13**	-0.13	2.04***	2.68***	1.45*
	(0.04)	(0.04)	(0.07)	(0.37)	(0.43)	(0.61)
Child characteristics						
Male	-0.14***	-0.14***		-0.94***	-0.99***	
	(0.03)	(0.03)		(0.27)	(0.29)	
Latinx	-0.04	-0.09		-1.97***	-2.29***	
	(0.05)	(0.05)		(0.45)	(0.49)	
Black	-0.35***	-0.35***		-3.18***	-3.29***	
	(0.06)	(0.06)		(0.54)	(0.59)	
Asian	-0.03	-0.01		2.90***	3.20***	
	(0.07)	(0.07)		(0.58)	(0.66)	
Health rating (1 being highest rating)	-0.02	-0.02	0.05	-0.92**	-0.97**	-0.27
	(0.02)	(0.02)	(0.04)	(0.23)	(0.25)	(0.34)
English language learner	-0.23***	-0.20***	-0.05	-1.64**	-1.49**	-0.48
	(0.05)	(0.06)	(0.10)	(0.53)	(0.55)	(0.98)
Has disability	-0.33***	-0.33***	0.20*	-5.61***	-5.59***	-0.99
	(0.05)	(0.05)	(0.08)	(0.39)	(0.46)	(0.79)
Attended prekindergarten	-0.01	0.00		0.51	0.28	
	(0.07)	(0.06)		(0.47)	(0.35)	
Attended full-day kindergarten	0.03	-0.01		1.53**	1.39	
	(0.05)	(0.10)		(0.44)	(0.79)	
In before/after school care during kindergarten	-0.00	-0.03		-1.14*	-1.21*	
	(0.07)	(0.08)		(0.46)	(0.49)	
Absences	-0.01	-0.01*	-0.01	-0.14***	-0.17***	-0.08
	(0.00)	(0.00)	(0.01)	(0.03)	(0.04)	(0.09)
Family characteristics						
Two-partner household	0.09	0.11	0.04	0.64	0.57	0.81
	(0.04)	(0.05)	(0.11)	(0.36)	(0.39)	(0.95)
Number of siblings	-0.01	-0.02	0.04	-0.15	-0.14	0.35
	(0.02)	(0.02)	(0.09)	(0.13)	(0.14)	(0.98)
Chose school for child	0.01	0.01		0.07	-0.05	
	(0.03)	(0.03)		(0.29)	(0.32)	
Chose house for school	0.08*	0.05		-0.06	-0.26	
	(0.03)	(0.05)		(0.50)	(0.75)	
Mother has at least college degree	0.23***	0.20***	0.49	1.18**	1.02*	-3.81
	(0.04)	(0.05)	(0.34)	(0.36)	(0.39)	(2.93)
Father has at least college degree	0.07	0.07	0.09	1.41***	1.24**	-2.01
	(0.04)	(0.04)	(0.37)	(0.36)	(0.39)	(2.63)
Mother employed full time	0.06*	0.03	-0.09	0.99**	0.93**	0.99
	(0.03)	(0.03)	(0.07)	(0.30)	(0.31)	(1.10)
Father employed full time	-0.01	0.02	-0.06	0.95*	1.03*	0.92
	(0.04)	(0.05)	(0.08)	(0.40)	(0.42)	(0.89)
Poverty	-0.13**	-0.13*	0.19	-1.40***	-1.28**	1.06
	(0.04)	(0.05)	(0.18)	(0.36)	(0.39)	(0.86)
Classroom characteristics						
Class size	-0.01	-0.00	0.00	-0.02	-0.09	-0.12
	(0.01)	(0.01)	(0.01)	(0.05)	(0.08)	(0.08)
Percent girls	0.33	0.20	0.35	0.57	0.30	-1.19
	(0.18)	(0.21)	(0.33)	(1.65)	(2.21)	(2.57)
Percent Black	-0.29**	0.03	0.27	-1.53	0.57	1.06
	(0.09)	(0.18)	(0.30)	(0.91)	(1.72)	(2.76)
Percent Latinx	-0.33***	-0.34*	0.05	-2.97**	-0.89	2.83
	(0.09)	(0.16)	(0.25)	(0.92)	(1.44)	(2.31)
Percent Asian	-0.12	-0.19	0.22	-1.71	-1.97	-2.03
	(0.15)	(0.27)	(0.35)	(1.57)	(3.66)	(3.31)
Percent below grade level in reading	-0.50***	-0.50***	0.29	-3.94**	-4.28*	3.05
	(0.13)	(0.14)	(0.20)	(1.29)	(1.66)	(2.05)
Percent below grade level in math	-0.44*	-0.33	0.12	-2.05	-1.54	-1.61
	(0.17)	(0.18)	(0.27)	(1.85)	(2.10)	(3.35)
Percent with disability	-1.14***	-1.22**	-0.34	-9.42***	-9.61***	-2.38
	(0.22)	(0.24)	(0.26)	(1.80)	(1.86)	(2.09)
Percent English Language Learner	-1.77**	-1.94*	-0.42	-7.18	-7.63	10.58
	(0.63)	(0.85)	(0.78)	(4.03)	(5.24)	(7.88)
Teacher characteristics						
Black	-0.08	0.02	0.12	-0.58	-1.08	-0.39
	(0.07)	(0.08)	(0.10)	(0.84)	(0.86)	(0.88)
Latinx	-0.15*	-0.19*	-0.06	-0.56	-1.07	-0.51
	(0.07)	(0.08)	(0.11)	(0.63)	(0.71)	(0.89)
Asian	-0.13	-0.28	-0.26	-1.12	-0.26	0.81
	(0.11)	(0.14)	(0.16)	(0.95)	(1.14)	(1.60)
Years of experience	-0.00	-0.00	-0.00	0.01	0.01	0.02
	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)	(0.02)
MA degree or higher	0.03	0.01	-0.04	0.30	0.38	-0.05
	(0.03)	(0.04)	(0.05)	(0.33)	(0.37)	(0.43)
n	30,064	30,064	30,064	30,057	30,057	30,057

*Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.*

Table 5: Differences by Black, Latinx, and Asian Groups

	Reading			Math			DCCS			W Ability		
	Black	Latinx	Asian	Black	Latinx	Asian	Black	Latinx	Asian	Black	Latinx	Asian
Ethnoracial match with teacher	1.72***	1.75**	-0.13	1.78**	0.90*	-0.17	-0.19	-0.17	0.22	4.84*	2.89*	3.43
	(0.88)	(0.59)	(1.34)	(0.61)	(0.47)	(0.95)	(0.23)	(0.15)	(0.27)	(2.27)	(1.20)	(2.71)
Child characteristics	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Family characteristics	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Classroom characteristics	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Teacher characteristics	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
n	6,153	8,198	4,170	6,120	8,195	4,101	6,124	8,205	4,103	6,124	8,205	4,103

*Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. All models are using student fixed effects.*