Emerald Insight

Education and Youth Today

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Achievement During Elementary and Middle School
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Article information:

To cite this document: Jacob Hibel Daphne M. Penn R. C. Morris . "Ethnoracial
Concordance in the Association between Academic Self-Efficacy and Achievement
During Elementary and Middle School" *In* Education and Youth Today. Published online:
27 Jul 2016; 31-63.
Permanent link to this document:
http://dx.doi.org/10.1108/S1537-466120160000020002

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ETHNORACIAL CONCORDANCE IN THE ASSOCIATION BETWEEN ACADEMIC SELF-EFFICACY AND ACHIEVEMENT DURING ELEMENTARY AND MIDDLE SCHOOL

Jacob Hibel, Daphne M. Penn and R. C. Morris

ABSTRACT

Purpose − *Social psychological perspectives on educational stratification offer explanations that bridge the macro and micro social worlds. However, while ethnoracial disparities in academic achievement are evident during the earliest grade levels, most social psychological research in this area has examined high school or college student samples and has used a black−white binary to operationalize race.*

Design/methodology/approach − *We use longitudinal structural equation models to examine links between academic self-efficacy beliefs and school performance among a national sample of diverse third- through eighth-grade students in the United States.*

Findings − *Contrary to hypotheses derived from the student identity literature, we find no evidence that elementary and middle school students from different ethnoracial backgrounds vary in the degree to which they selectively discount evaluative feedback in their academic self-efficacy construction, nor in the extent to which they demonstrate disrupted links between academic self-efficacy and subsequent academic performance.*

Originality/value − *The study examines the extent to which race-linked social psychological processes may be driving academic achievement inequalities during the primary schooling years.*

Racial and ethnic inequalities in academic achievement continue to be a major concern among educators, researchers, and policy-makers. Although debates surrounding these issues have historically focused on the prevalence and causes of black−white achievement gaps, the rapid growth of Latino and Asian American populations in the United States has necessitated a more inclusive perspective on ethnoracial inequality. Recent findings suggest that Latino students experience average achievement and attainment disadvantages relative to non-Latino whites (Herman, 2009; Lee, 2002; Reardon & Galindo, 2009), while Asian American students, on average, outpace non-Latino whites with respect to grades and test scores (Jencks & Phillips, 1998; Kao, 1995; Kao & Thompson, 2003). Family resources, particularly parental socioeconomic status, are the best predictors of students' disparate academic outcomes (Kao & Thompson, 2003), yet these factors typically leave something on the order of 50% of ethnoracial achievement gaps unexplained (Duncan & Magnuson, 2005). Thus, researchers have also examined ethnoracial variation in certain student-level factors as proximate mechanisms driving patterns of achievement inequality, including beliefs about schooling's importance or personal relevance (Mickelson, 1990), educational expectations and aspirations (Goldsmith, 2004), achievement's desirability in light of local peer cultures (Fordham & Ogbu, 1986), and the impact of negative racial stereotypes on academic performance (Cohen & Garcia, 2008; Owens & Massey, 2011; Steele, 1992; Steele & Aronson, 1995). Ethnoracial variation in students' academic self-efficacy

beliefs represents another potential student-level catalyst of academic stratification.

In the present study, we examine ethnoracial variation in students' literacy and mathematics self-efficacy beliefs during the elementary and middle school years, as well as the associations between academic self-efficacy and academic achievement over the same time span. In doing so, our analysis casts light upon persistent questions regarding young ethnoracial minority students' academic identity formation during childhood and early adolescence. Theoretical perspectives derived from research on identity theory, role identification, and stereotype internalization frame our analysis, which extends prior empirical studies in these areas by turning attention to a younger and more diverse sample of U.S. students. Studies assessing the influence of stereotype-linked performance burdens and academic disidentification on patterns of ethnoracial academic stratification have primarily focused on secondary and post-secondary students. However, ethnoracial achievement gaps are evident from the moment kindergarteners first enter school (Lee & Burkam, 2002), and we therefore examine the extent to which race-linked social psychological processes may be driving these academic achievement inequalities during the primary schooling years.

ACADEMIC SELF-EFFICACY, ACHIEVEMENT, AND INEQUALITY

Self-efficacy beliefs, or beliefs about one's ability to be a causal agent in life, are a fundamental component of an individual's sense of self (Gecas & Schwalbe, 1983, 1986; Gecas & Seff, 1989, 1990; Marcussen, Ritter, & Safron, 2004; Owens & Serpe, 2003). While individuals possess a global sense of self-efficacy comprising a unidimensional belief about their ability to be generally agentive, they also possess *domain-specific* self-efficacy beliefs. As children begin formal schooling, they develop domain-specific self-efficacy beliefs related to the classroom context and the student social role. For example, children develop self-efficacy beliefs regarding their ability to successfully perform mathematics exercises, as well as anticipated feedback from their teachers after completing them. These beliefs and expectations represent the foundation of students' mathematics-specific academic self-efficacy.

Efficacy is a sense of competence derived from social comparisons of effective performance in addition to the norms and values shaping an

individual's behavior in the academic setting (Gecas, 1982). Successes in an academic subject generate positive social feedback, which bolsters a student's sense of academic self-efficacy and consequently increases motivation, while negative evaluative feedback associated with academic failures decreases a student's sense of efficacy, lowering their academic self-efficacy beliefs and motivation (Gecas, 1989).

People who perceive themselves as possessing low efficacy in a particular domain tend to avoid participation in activities related to that domain, curb their domain-specific aspirations, and more readily capitulate in the face of challenging tasks related to that domain (Bandura, 1997; Bandura, Barbaranelli, Caprara, & Pastorelli, 2001). We might, therefore, expect the relationship between students' academic self-efficacy beliefs and their academic performance to become mutually reinforcing over time. Indeed, empirical findings support such a reciprocal longitudinal relationship between academic self-efficacy and achievement (Marsh & O'Mara, 2008). For example, in addition to the bolstering effects of academic success on academic self-efficacy beliefs, holding high academic self-efficacy beliefs in the elementary and middle school years is associated with positive high school outcomes, including higher academic achievement (Marsh, 1990), increased college aspirations (Murdock, Anderman, & Hodge, 2000), lower risk of dropout (Reyes & Jason, 1993), greater academic effort (Murdock et al., 2000), enhanced career aspirations, and increased probability of college attendance (Marsh, 1991). As students' progress through school, their academic self-efficacy beliefs become increasingly stable and more strongly correlated with academic achievement (Guay, Marsh, & Boivin, 2003). Therefore, to the extent that students from historically disadvantaged ethnoracial backgrounds develop comparatively low academic self-efficacy beliefs during childhood and adolescence, we would expect such disparities to exacerbate ethnoracial achievement inequalities. Moreover, the developmental feedback loop that characterizes the achievement-self-efficacy association implies that the younger students are when such ethnoracial disparities emerge, the more deleterious the consequences of these disparities will be.

Students' academic identities begin to crystallize in early childhood and, on average, academic self-efficacy declines during pre- and early adolescence before increasing through late adolescence and early adulthood (Marsh, 1993). We take a longitudinal perspective on the association between academic self-efficacy and achievement in the present study, focusing on a window beginning in third grade and concluding with the transition to high school (i.e., the period comprising academic self-efficacy's

crystallization and early-adolescent decline). This is a particularly significant period in which to examine academic self-efficacy inequalities, as adolescents from urban, ethnoracial minority, and low-income backgrounds are especially susceptible to academic performance declines following the transition to high school (Newman, Lohman, Newman, Myers, & Smith, 2000; Reyes, Gillock, Kobus, & Sanchez, 2000). However, high academic self-efficacy beliefs at the time of such transitions are associated with higher levels of academic motivation and subsequent achievement, especially among ethnoracial minority students (Zanobini & Usai, 2002).

LINKS AMONG ETHNORACIAL IDENTITY, ACADEMIC SELF-EFFICACY, AND ACHIEVEMENT

Despite strong associations among self-efficacy beliefs, motivation, and achievement, external beliefs, especially as they pertain to minority groups, have the potential erode or reinforce the relationship between academic self-efficacy and achievement among minority group members. For example, Steele and colleagues' stereotype threat hypothesis suggests that the prospect of confirming negative racial stereotypes regarding a domain with which one is strongly identified evokes anxiety, which directly and negatively influences domain-specific performance (Sackett, Hardison, & Cullen, 2004; Steele, 1997; Steele & Aronson, 1995). In addition, a recent review found that stereotype threat not only negatively impacts minority students' test taking, but also their learning and identification with specific academic domains and academics as a whole (Appel & Kronberger, 2012). Although much of the stereotype threat literature focuses on African American students, a few studies have examined the stereotype threat hypothesis for other lower status minority groups (Gonzales, Blanton, & Williams, 2002; Lovaglia, Lucas, Houser, Thye, & Markovsky, 1998). Findings from this line of research generally suggest that, like African Americans, Latino high school and college students experience performance declines in the face of negative stereotyping (Massey & Fischer, 2005).

The concept of academic performance burden is central to the stereotype threat hypothesis. In the traditional sense, the academic performance burden refers to the fear of confirming negative stereotypes of intellectual inferiority, which causes minority students to underperform on tasks such as achievement tests. However, positive stereotypes can create a different form of academic performance burden among members of "model

minority" groups (Cheryan & Bodenhausen, 2000). Asian and Asian American students are particularly susceptible to this particular type of stereotype threat, as they are often stereotyped as highly intelligent (Kao, 1995). While privately held positive academic expectations can lead to increased academic performance (Lee & Zhou, 2014; Shih, Pittinsky, & Ambady, 1999), externally imposed positive expectations have the potential to burden students who experience anxiety surrounding the possibility of failing to live up to the positive stereotype (Baumeister, Hamilton, & Tice, 1985). Hence, whether negative or positive, externally imposed intellectual stereotypes place an academic performance burden on students from racial or ethnic minority backgrounds as they struggle to either defy or live up to the stereotypical expectations.

Findings from extant research in this area thus lead directly to a testable proposition regarding the association between students' academic self-efficacy beliefs and academic performance. Students from negatively stereotyped backgrounds − Latino and African American students in the present study − and positively stereotyped Asian students alike should experience impediments to the realization of their academic potential as a result of externally imposed anxieties. If this were the case, non-white race/ethnicity would emerge as a significant moderator of academic self-efficacy's association with subsequent academic performance compared to the association observed among non-Latino white students.

While laboratory-based studies typically examine acute consequences (e.g., performance on a cognitive challenge task), academic stereotyping may also generate longer term academic disadvantages. Over time, stereotype-driven academic underperformance leads to academic disidentification, the psychological process by which students strategically discount potentially damaging judgments related to their low academic performance in the formation of their academic self-perceptions, thereby diminishing the relative importance of achievement outcome expectations (Steele, 1992, 1997). This adaptive response shields the psyche from harm by disrupting the link between low academic performance and downwardly revised academic self-efficacy beliefs. However, by devaluing external appraisal information such as grades, test scores, or teacher feedback, students may lose the motivation to pursue these sources of validation and consequently forego the educational, social, and economic rewards associated with these markers of academic success.

Our conceptual framework provides an opportunity to observe this process. In the presence of academic disidentification, students from negatively stereotyped backgrounds would demonstrate weaker associations between

their academic performance and subsequent academic self-efficacy beliefs than non-Latino white students.

Fig. 1 presents associations that correspond to our central hypotheses. This diagram illustrates two key relationships: path *A*, the association between students' academic achievement and subsequent academic self-efficacy beliefs and path *B*, the reverse association between students' academic self-efficacy beliefs and subsequent academic performance. In addition to modeling the dynamic nature of these associations over the six-year period spanning children's third- and eighth-grade years, we examine students' ethnoracial identity as a moderator of each association. In modeling path A_1, we test the hypothesis that students from historically lower performing backgrounds experience psychological discounting of evaluative feedback in the process of academic self-efficacy belief formation. Previous research has focused on this phenomenon as an early step in the process of withdrawal from academic endeavors among high school and college students from negatively stereotyped minority backgrounds (Massey & Fischer, 2005; Morgan & Mehta, 2004). By modeling the relationship between academic performance and academic self-efficacy during the elementary and middle school years and among multiple ethnoracial groups, this study contributes to our understanding of a potential mechanism by which achievement disparities emerge and grow over time.

Path B_1 in Fig. 1 represents the disrupted positive association between academic self-efficacy beliefs and subsequent academic performance predicted by the hypothesis that students from negatively stereotyped ethnoracial backgrounds face unique and substantial social psychological obstacles in the process of converting their academic potential into realized achievement. Since the publication of Steele and colleagues' pioneering work (Steele, 1992, 1997; Steele & Aronson, 1995), an abundance of empirical research has examined the consequences of negative racial stereotypes for
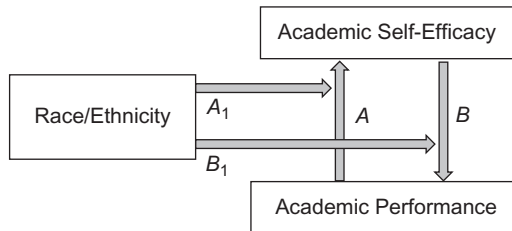

Fig. 1. Conceptual Diagram of Relationships Pertaining to Study Hypotheses.

minority students' academic performance. However, this line of research
has focused largely on African American students and almost exclusively
on high school and college-aged individuals. By turning attention to an
ethnoracially diverse elementary and middle school sample, we evaluate the
centrality of social psychological influences to the processes driving early-
life course achievement disparities.

YOUNG CHILDREN'S ACADEMIC STEREOTYPE CONSCIOUSNESS

It is necessary for individuals to comprehend their own socially constructed
racial identities and to be aware of racial and ethnic stereotypes for those
factors to influence their academic performance. While it may be safe to
assume that adolescents and young adults possess such awareness, it is not
clear that younger children have a similarly well-developed understanding
(Okeke, Howard, Kurtz-Costes, & Rowley, 2009). In general, prior
research has demonstrated that children are aware of racial distinctions at
early ages (Hirschfeld, 1998, 2012), yet the development of "stereotype
consciousness" (McKown & Weinstein, 2003) is a developmental process
that unfolds during the elementary school years and is shaped by individual
and contextual factors ranging from cognitive development to exposure to
discriminatory curriculum tracking practices (Copping, Kurtz-Costes,
Rowley, & Wood, 2013; Losen & Orfield, 2002; McKown, Gregory, &
Weinstein, 2010; Rowley, Kurtz-Costes, Mistry, & Feagans, 2007). We
should thus expect children's understanding of their location in the racia-
lized intellectual stereotype hierarchy to vary within individual children as
they age as well as across individuals and social contexts.

The age-dependent nature of the social psychological processes at the
center of our study leads to an alternative set of hypotheses. Unlike the
expected relationships represented in Fig. 1 and described above, which
rest on the implicit assumption that third through eighth graders are cogni-
zant of widely held ethnoracial academic stereotypes, we might instead
hypothesize that, on average, elementary and middle school students will
demonstrate equivalent associations between academic self-efficacy and
academic achievement across racial ethnic/groups. To the extent that young
students possesses only an inchoate sense of racial and ethnic academic
stereotypes or the salience of their ethnoracial identities to the domain of
schooling, stereotype threat and the closely associated phenomenon of

academic disidentification could not be major influences on academic achievement, identity formation, or disparities therein.

DATA AND METHOD

We examine the propositions described above using panel data from the third-, fifth-, and eighth-grade waves of the Early Childhood Longitudinal Study, Kindergarten Class of 1998−1999 (ECLS-K). The ECLS-K focuses on children's school experiences beginning in kindergarten and ending in the eighth grade. Drawing on multiple sources and using multiple methods of data collection, the ECLS-K includes information from direct child assessments; interviews with parents; questionnaires administered to children, parents, teachers, and school principals; and official student records. The ECLS-K began following a nationally representative cohort of approximately 20,000 kindergarteners in the fall of 1998, and subsequent waves of data were collected from the sample in the spring of 1999 (kindergarten), fall of 1999 (first grade), spring of 2000 (first grade), spring of 2002 (third grade), spring of 2004 (fifth grade), and spring of 2007 (eighth grade). We restrict our analysis to data from the final three waves of data collection as these were the only waves in which students provided reports of their academic self-perceptions.

As is the case in most large-scale, longitudinal studies, missing data present a challenge to ECLS-K analysts. Sample attrition is the source of much of this missingness, with approximately 50% of the original ECLS-K sample leaving the study between the kindergarten and eighth-grade waves of data collection. We adjust for attrition-related bias in two ways: by incorporating a child-level probability weight[1] in all analyses and employing the full information maximum likelihood estimator, which provides bias-free estimates in the presence of attrition and item-nonresponse under the assumption that data are missing at random − an assumption shared with other common methods for handling missing data (e.g., multiple imputation) (Allison, 2001). We estimate our full analytic model using data from 11,139 students, including 6,751 non-Latino white students, 1,341 non-Latino black students, 2,222 Latino students, and 825 Asian students.

Key variables examined in the present study include students' race/ethnicity, domain-specific academic self-efficacy and academic achievement, as well as teacher evaluations of students' academic ability. Using parent reports of ECLS-K participants' racial and pan-ethnic identities from

the first wave of data collection, we group students into non-Latino white, non-Latino black, Latino (any race), and Asian categories. To maintain sufficient sample sizes and theoretical continuity with previous work on academic self-efficacy and achievement, we excluded from the analysis 1,154 students who were from other ethnoracial backgrounds (e.g., Pacific Islander, American Indian/Alaska Native), whose parents reported more than one race, or whose ethnoracial identities were not reported.

We follow the work of Pajares (1996) and others who have contributed to a growing body of literature that focuses on the importance of specific domains of self-efficacy (Bandura et al., 2001, Crosnoe, Mistry, & Elder, 2002; Gecas, 1989; Pajares, 1996). We divide academic self-efficacy into components reflecting two distinct academic domains: literacy self-efficacy and mathematics self-efficacy (Shavelson, Hubner, & Stanton, 1976). Domain-specific academic self-efficacy is a consistently stronger predictor of academic achievement in the corresponding subject area than is a general measure of academic self-efficacy (Marsh, 1992; Rosenberg et al., 1995) and statistical analysis indicates that the different domains of academic self-efficacy are largely independent of one another (Marsh, Byrne, & Shavelson, 1988). For these reasons, it is important for studies of academic self-efficacy's antecedents and effects to operationalize student role-identity and associated academic self-efficacy in a multidimensional, domain-specific manner.

ECLS-K respondents completed the verbal/reading and mathematics portions of the Self-Description Questionnaire II (SDQII) (Marsh, 1992) during the third-, fifth-, and eighth-grade waves of data collection. The SDQII is a strong multidimensional measure of adolescent self-concept (Marsh, Parada, & Ayotte, 2004; Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005), including domain-specific self-efficacy beliefs (see Gilman, Laughlin, & Huebner, 1999 for more on discriminant validity). This questionnaire assessed respondents' perceived efficacy in English and mathematics classes, as well as their interest in and enjoyment of reading and mathematics. Students rated their agreement with statements regarding their academic self-perceptions on a four-point scale ranging from "not at all true" to "very true."

Academic self-efficacy is modeled as a latent construct, with each factor's measurement model estimated as part of the SEM. We conducted confirmatory factor analyses for reading and mathematics self-efficacy using a subset of SDQII items. In the third- and fifth-grade waves, each score reflects students' responses to three statements: "I am good at reading/ math," "work in reading/math is easy for me," and "I get good grades in

reading/math." In the eighth-grade wave, we used students' responses to two statements: "English/math is one of my best subjects" and "I get good grades in English/math." These items capture a student's sense of competence, mastery, and a measure of social comparison, essential elements for the measurement of self-efficacy (Bong & Skaalvik, 2003). Internal reliability falls within the acceptable range for both factors at each wave, with alpha coefficients ranging from .74 to .86. Confirmatory factor analysis results confirmed at least partial metric and scalar measurement invariance across groups for each academic self-efficacy factor (see the appendix for measurement model details for these and all other latent factors).

We measure academic performance via children's scores on item response theory (IRT)-scaled literacy and mathematics achievement tests completed at each wave of data collection. As they are measured on a common scale across waves, these IRT scores allow students' proficiency levels to be compared to one another regardless of the students' age or ability level (Tourangeau, Lê, Nord, & Sorongon, 2009). We divide students' scores by 100 to enhance the regression coefficients' interpretability while also improving the behavior of the covariance structure analysis by converting the test scores' variance into a range comparable to the other model covariates.

Finally, we included domain-specific teacher evaluations of students' academic ability. Similar to our operationalization of academic self-efficacy, teacher evaluations are modeled as latent variables in the SEM. Third- and fifth-grade teachers rated students' competencies in literacy and mathematics on a five-point scale ranging from "not yet demonstrating" to "proficient," while eighth-grade teachers evaluated students' abilities on a five-point scale ranging from "poor" to "outstanding." Language items focused on children's skills in reading ability and comprehension as well as written and oral expression, while mathematics items represent teachers' perceptions of students' problem solving and mathematical abilities (Tourangeau et al., 2009). All ECLS-K participants were evaluated by their English teachers in eighth grade. However, only a randomly selected half of the participants were evaluated by their math teachers (the other half were evaluated in science). As with the academic self-efficacy measures, we conducted confirmatory factor analyses of these domain- and grade-level-specific items to establish reliability and inter-group metric and scalar measurement invariance. Standardized scales of the teacher evaluation items demonstrated high internal reliability, with alpha coefficients ranging from .91 to .96.

These teacher evaluations are important for two reasons. First, while the ECLS-K data do not include information regarding students' course

grades, teachers' evaluations of students' academic competencies are a proxy indicator of their classroom performance as subjectively rated by their teachers. Thus, to the extent that students' academic self-efficacy beliefs are positively associated with academic performance, we would expect to find that students with higher academic self-efficacy scores receive higher evaluations from their teachers as well. In addition, we would expect teacher evaluations to be powerful predictors of student's academic self-perceptions given the centrality of evaluative feedback to the academic self-efficacy formation process. Because students' academic self-efficacy beliefs are formed through ongoing interactions with and evaluations by significant others, classroom teachers' perceptions of students' academic ability are likely to have a direct, independent influence on students' academic self-perceptions (Marsh, 1993; Rosenberg, 1979; Shavelson et al., 1976).

METHOD

We model the associations among our variables of interest as a longitudinal system of simultaneous regression equations (i.e., a panel SEM). Our analyses employ robust standard errors, which adjust standard error estimates for student clustering within elementary schools.

Given our research questions and data structure, the SEM approach offers a superior alternative to multilevel regression approaches (Allison, 2009; Raudenbush & Bryk, 2002). The reciprocal association between academic achievement and academic self-efficacy beliefs necessitates a more complex model specification than a single-outcome regression model would allow. The cross-lagged SEM model presented in stylized form in Fig. 2 offers a solution to this problem by providing simultaneous estimates of the reciprocal associations among students' academic self-efficacy beliefs, test performance, and teacher evaluations, while accounting for each variable's autoregressive stability over time. With respect to the former point, a regression-based alternative would require estimating each path presented in Fig. 2 via a separate model. The clear downside to this approach is the proliferation of significance tests and the corresponding increase in the probability of type-I error such a strategy creates. This issue would be further exacerbated by our focus on ethnoracial moderation of each hypothesized association, as each regression model would also require estimating interaction terms between student race/ethnicity dummies and
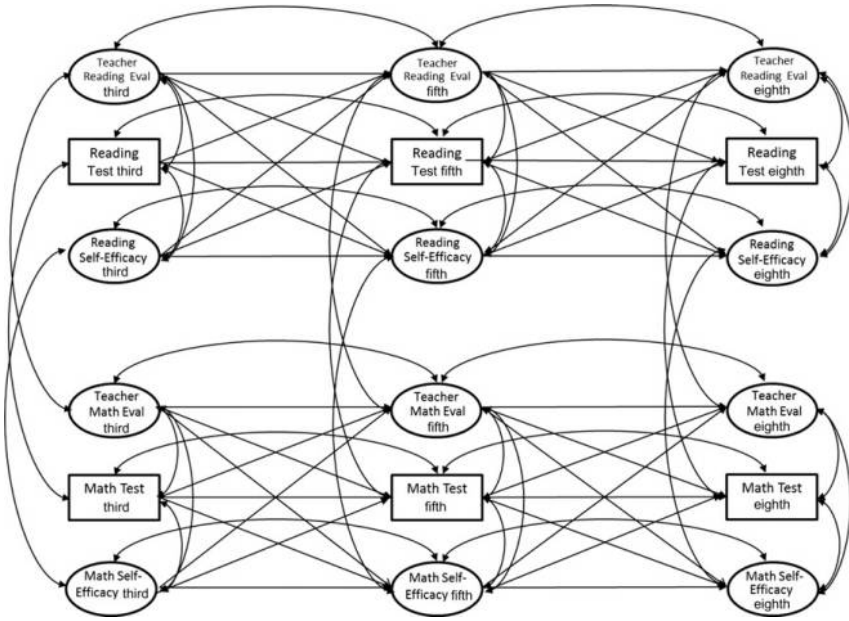
Fig. 2. Conceptual Presentation of the Full Cross-Lagged Panel Model.

the independent variables of interest. The SEM approach, by contrast, allows us to estimate all associations in a single model and to test for ethnoracial moderation of these relationships by conducting multiple group analysis (i.e., estimating the structural model parameters separately for non-Latino whites, African Americans, Latinos, and Asians) and using omnibus model fit indices to evaluate our hypotheses rather than coefficient-by-coefficient significance tests.

The SEM's ability to account for serial autocorrelation among the endogenous variables is a second key advantage. OLS regression approaches do not provide a way to account for endogenous variables' correlated errors over repeated waves; a shortcoming that may produce biased estimates of the structural coefficients of interest. The SEM approach, however, allows us to model the correlations among the disturbance terms for the same variable over time (as well as among different endogenous variables measured at the same time point), thereby avoiding bias stemming from serial correlation (Bollen & Brand, 2010).

Our approach takes the following form: we begin by estimating the SEM allowing all structural parameters to vary freely across ethnoracial groups (i.e., a structurally non-invariant model), taking note of model fit index scores (χ^2, BIC, RMSEA, CFI/TLI, and SRMR). This model provides estimates of the structural relationships under the condition of complete ethnoracial moderation, and can be expected to yield a close fit to the data at the expense of additional degrees of freedom. Next, we estimate a model in which all structural parameters are constrained to be equal across ethnoracial groups, again noting the estimated model fit. This model provides estimates under the condition of complete absence of ethnoracial moderation of the structural associations. While the fully constrained model is conservative of degrees of freedom, the model fit will be comparatively poor in the event that students from different ethnoracial groups experience unequal associations among the covariates. Finally, we take fully constrained model and, using information from model modification index and expected parameter change statistics, iteratively relax individual structural parameter constraints until we arrive at a model specification that provides equivalent or better fit to the data compared to the structurally non-invariant (i.e., fully moderated) SEM. We use Mplus v7.11 to estimate all models.

Each of our hypotheses implies cross-group variability in the model's structural parameter estimates (i.e., we anticipate that the strength of relationships among external performance indicators and children's self-evaluations will vary by race/ethnicity in specific ways). Therefore, to the extent that allowing cross-group variation in the key structural parameters (i.e., the relationships represented by paths *A* and *B* in Fig. 1) significantly improves model fit and reveals differential associations that are consistent with a given hypothesis, the corresponding hypothesis is supported, while structural invariance suggests that the relationship in question does not operate differently according to students' race/ethnicity, thus failing to support the corresponding hypothesis.

RESULTS

Descriptive Statistics

Table 1 presents variable means and standard deviations for each key variable, calculated separately by grade level and student race/ethnicity.

Table 1. Descriptive Statistics by Race/Ethnicity and Grade Level.

	Third Grade			Fifth grade			Eighth Grade		
	Mean	SD	*n*	Mean	SD	*n*	Mean	SD	*n*
	Reading achievement			Reading achievement			Reading achievement		
All students	1.267	0.280	14,280	1.501	0.248	11,265	1.710	0.276	9,225
Non-Latino White	1.347	0.258	6,541	1.571	0.238	6,442	1.777	0.237	5,663
Non-Latino Black	1.123***	0.251	1,273	1.349***	0.256	1,266	1.510***	0.294	942
Latino	1.157***	0.272	2,119	1.398***	0.258	2,081	1.597***	0.294	1,604
Asian	1.286***	0.263	803	1.513***	0.257	781	1.771	0.248	513
	Math achievement			Math achievement			Math achievement		
All students	0.987	0.247	14,374	1.237	0.248	11,274	1.422	0.276	9,285
Non-Latino White	1.053	0.229	6,558	1.294	0.223	6,447	1.468	0.193	5,707
Non-Latino Black	0.834***	0.217	1,291	1.062***	0.244	1,267	1.255***	0.23	954
Latino	0.908	0.232	2,129	1.161***	0.244	2,082	1.353***	0.228	1,605
Asian	1.039	0.252	802	1.306	0.242	781	1.494**	0.211	512
	Reading self-efficacy			Reading self-efficacy			Reading self-efficacy		
Non-Latino White	0.000	0.609	6,570	0.000	0.672	6,449	0.000	0.874	5,688
Non-Latino Black	0.079	0.648	1,295	−0.011	0.741	1,271	−0.021	0.860	941
Latino	−0.083**	0.624	2,131	−0.261***	0.701	2,083	−0.284***	0.897	1,602
Asian	−0.231***	0.630	803	−0.257***	0.694	780	0.077	0.784	512

Table 1. (*Continued*)

	Third Grade			Fifth grade			Eighth Grade		
	Mean	SD	*n*	Mean	SD	*n*	Mean	SD	*n*
	Math self-efficacy			Math self-efficacy			Math self-efficacy		
Non-Latino White	0.000	0.742	6,570	0.000	0.75	6,450	0.000	1.057	5,688
Non-Latino Black	0.102**	0.780	1,295	−0.066*	0.86	1,271	−0.163***	1.050	944
Latino	0.009	0.754	2,131	−0.166***	0.81	2,083	−0.292***	1.081	1,606
Asian	−0.048	0.738	803	0.024	0.73	780	0.025	1.052	511
	Teacher reading eval.			Teacher reading eval.			Teacher reading eval.		
Non-Latino White	0.000	0.825	5,789	0.000	0.804	6,224	0.000	1.002	5,611
Non-Latino Black	−0.417***	0.871	1,001	−0.350***	0.868	1,217	−0.572***	0.985	906
Latino	−0.240***	0.853	1,493	−0.255***	0.802	1,925	−0.346***	0.989	1,493
Asian	0.072	0.833	591	0.194***	0.814	734	0.229***	0.983	487
	Teacher math eval.			Teacher math eval.			Teacher math eval.		
Non-Latino White	0.000	0.865	5,732	0.000	0.608	3,105	0.000	0.960	2,790
Non-Latino Black	−0.329***	0.904	986	−0.462***	0.672	583	−0.521***	1.017	432
Latino	−0.186***	0.874	1,481	−0.201***	0.622	950	−0.337***	1.034	734
Asian	0.156***	0.898	590	−0.273***	0.580	358	−0.302***	1.014	245

***$p < .001$; **$p < .01$; *$p < .05$ (two-tailed *t*-tests, non-Latino whites are reference group).

The estimated factor means for academic self-efficacy and teacher ability evaluations reported in Table 1 are scaled such that non-Latino white students' factor means take a value of zero and African American, Latino, and Asian students' means represent differences from the non-Latino white average.[2] Positive values thus represent higher mean scores than white students and negative scores represent comparatively lower means.

Achievement test scores follow what has become a familiar pattern in the sociology of education. In the literacy domain, non-Latino white students demonstrate an achievement advantage relative to African American, Latino, and, to a lesser extent and only during the elementary school waves, Asian students. While African American and Latino students also face math achievement disadvantages relative to white students at each wave, Asian students' math scores do not differ significantly from whites' during the third and fifth grades, and their scores significantly exceed white students' in eighth grade.

In light of these academic performance trends, students' longitudinal patterns of academic self-efficacy are somewhat surprising. Despite having the lowest average literacy and math scores in third grade, African American third-graders report more positive self-efficacy beliefs in each domain than students from other ethnoracial backgrounds. Conversely, while Asian third-graders' average literacy test scores are higher than those of Latino and African American students, their average literacy self-efficacy beliefs are far less positive than any other groups.

Asian students continue to report lower literacy self-efficacy beliefs than their demonstrated performance would suggest as fifth graders, while their fifth-grade mathematics self-efficacy scores match non-Latino whites'. African American students' self-efficacy scores regress between the third and fifth grades, reaching statistical equivalence with white students' scores in the literacy domain and significantly lagging in mathematics. Latino fifth-graders' average academic self-efficacy scores are significantly lower than non-Latino white students' in both domains, and have the lowest mean value of any group.

Academic self-efficacy patterns again demonstrate a shift between the fifth and eighth grades. As students prepare to enter high school, African Americans' mathematics self-efficacy scores continue their comparative decline relative to non-Latino whites. Asian students, on the other hand, experience rising relative academic self-efficacy over the middle school years, reporting statistically equivalent levels of literacy and math self-efficacy beliefs to non-Latino white students at the conclusion of eighth grade. Latino students experience no such improvement, however, as their

eighth-grade academic self-efficacy scores in both domains remain significantly lower than white students', and are substantially lower than Asian or African American students' mean scores as well.

As is the case with students' self-perceptions, classroom teacher evaluations of students' ability follow patterns that we might not necessarily predict based on students' demonstrated academic performance alone. For example, teachers rate Asian students' literacy and mathematics ability substantially more positively than white students' at each wave, yet Asian third and fifth-graders' literacy scores significantly trail those of white students and a significant Asian student advantage in mathematics achievement does not emerge until the eighth grade. This finding is consistent with research suggesting that Asian Americans are stereotyped as a model minority, and that teachers hold especially high expectations for their performance (Divoky, 1988; Lee & Zhou, 2014). Classroom teachers evaluate African American and Latino students more negatively than non-Latino white students at each time point. However, while third-grade black−white test score gaps in literacy and math amount to .8 and .9 standard deviations, respectively, African American students' teacher evaluations are approximately .4 standard deviations lower in these same domains, a pattern that persists over time and among Latino students as well. Thus, while classroom teachers evaluate both African American and Latino students as demonstrating significantly lower ability levels than non-Latino whites, these disparities are narrower than the corresponding achievement gaps.

By highlighting the substantial and, in certain cases, surprising ethnoracial variation in our variables of interest, these descriptive comparisons set the stage for our inferential analysis. Our first hypothesis predicts that, compared to non-Latino white students, non-white students will demonstrate weaker associations between academic self-efficacy and subsequent academic performance as measured by standardized test scores and teacher evaluations. The second hypothesis predicts that evaluative feedback in the form of test performance and teacher ability evaluations will be less strongly associated with black and Latino students' academic self-efficacy beliefs than those of non-Latino white and Asian students.

Structural Equation Model Results

Table 2 presents model fit statistics from the unconstrained (i.e., fully moderated), fully constrained (i.e., non-moderated), and final, partially constrained SEMs. Of particular note are the largely similar fit statistics from

Table 2. Model Fit Statistics for Unconstrained, Fully Constrained, and Final SEM.

	χ^2	df	CFI	TLI	RMSEA (90% Conf. Int.)	BIC	SRMR
Unconstrained structural model	14,328	7,924	0.966	0.963	0.017 (0.017, 0.017)	998,909	0.047
Fully constrained structural model	14,495	8,029	0.966	0.963	0.017 (0.017, 0.017)	998,546	0.051
Final model	14,395	8,011	0.966	0.964	0.017 (0.016, 0.017)	998,419	0.051

the unconstrained and fully constrained models. While the chi-square and standardized root mean square residual (SRMR) statistics favor the fully moderated over the non-moderated model specification, the RMSEA and closely related CFI/TLI statistics are agnostic regarding the better-fitting model, and the BIC, which privileges parsimonious model specifications, indicates that the non-moderated model is preferable. A comparison of these two models therefore suggests that ethnoracial moderation of the model's structural relationships is unlikely to be extensive; otherwise the fully constrained model would have provided a resoundingly poorer fit to the data than the unconstrained model. Indeed, after iteratively relaxing the fully constrained model's parameter equality constraints based on information from model modification indices until optimal fit was achieved, the resulting final model retained equality constraints on most structural path coefficients and disturbance term covariances, with only a few exceptions described later.

Table 3 presents estimates of each of the path coefficients presented in Fig. 2. In most cases, model fit statistics suggested that estimates for non-white students were not significantly different from the estimates for non-Latino white students, and in these cases only the non-Latino white coefficient is presented. Where presented in Table 3, coefficient estimates for non-Latino black, Latino, and Asian students represent statistically significant moderation of the structural path. In light of the different metrics in which the variables are measured, the standardized coefficient (β) column provides the most readily interpretable results, indicating the expected standard deviation-unit change in a given endogenous variable associated with a one-standard deviation increase in the exogenous variable.

Hypothesis 1. We hypothesized that students from non-white backgrounds would demonstrate weaker associations between academic

Table 3. Path Coefficients from Structural Model.

Lagged Independent Variable	Outcome											
	Reading self-efficacy						Teacher reading evaluation					
	Fifth grade			Eighth grade			Fifth grade			Eighth grade		
	b	SE	β	b	SE	β	b	SE	β	b	SE	β
Reading self-efficacy												
All students	0.487***	0.062	0.447	0.753***	0.097	0.693	0.002	0.024	0.002	0.045	0.029	0.032
Reading achievement												
All students	0.534***	0.087	0.214	−0.156	0.127	−0.053	0.911***	0.084	0.313	1.043***	0.126	0.271
Non-Latino Black students	0.598***	0.174	0.206	–	–	–	–	–	–	–	–	–
Latino students	0.692***	0.102	0.267	–	–	–	–	–	–	0.759***	0.143	0.21
Asian students	–	–	–	–	–	–	.923***	0.147	0.307	–	–	–
Teacher reading eval.												
All students	0.045	0.027	0.056	0.099**	0.031	0.106	0.433***	0.031	0.456	0.603***	0.060	0.495
Math self-efficacy												
All students	1.136***	0.128	1.141	0.606***	0.059	0.593	−0.01	0.018	−0.010	0.094***	0.027	0.075
Math achievement												
All students	0.282*	0.136	0.088	0.331*	0.148	0.101	0.669***	0.074	0.276	0.632***	0.149	0.157
Non-Latino Black students	0.756***	0.252	0.206	0.004	0.212	0.001	–	–	–	–	–	–
Asian students	–	–	–	0.819***	0.209	0.280	–	–	–	–	–	–
Teacher math eval.												
All students	−0.05	0.030	−0.063	0.037	0.068	0.027	0.358***	0.032	0.556	0.920***	0.094	0.561

	Outcome					
	Reading achievement					
	Fifth grade			Eighth grade		
	b	SE	*β*	*b*	SE	*β*
Reading self-efficacy						
All students	−0.020***	0.005	−0.051	0.007	0.006	0.018
Reading achievement						
All students	0.917***	0.013	0.996	0.909***	0.018	0.887
Non-Latino Black students	−	−	−	−	−	−
Math self-efficacy						
All students	−0.01*	0.003	−0.027	0.000	0.003	0.001
Math achievement						
All students	0.968***	0.014	0.978	0.851***	0.014	0.952
Non-Latino Black students	1.143***	0.042	0.982	0.886***	0.036	0.957

Note: Race/ethnicity-specific coefficients are reported only for groups whose relationships are significantly different form non-Latino Whites.

***$p < .001$; **$p < .01$; *$p < .05$; $n = 11,139$.

self-efficacy and subsequent performance as academic performance burdens disrupt their achievement. However, we find no evidence of ethnoracial variation in the strength or direction of associations between academic self-efficacy beliefs and subsequent achievement as measured by test performance and teacher ability evaluations. Moreover, our cross-lagged models provide little evidence at all of strong links between students' literacy or math self-efficacy beliefs and their subsequent performance, net of other model associations.

Our results also suggest that students' teacher-rated academic performance is largely independent of prior academic self-efficacy beliefs. The conditional associations between students' third-grade academic self-efficacy and their fifth-grade teachers' ability evaluations are non-significant in both academic domains, as is the association between students' fifth-grade literacy self-efficacy beliefs and their eighth-grade teachers' evaluations of their reading ability. An exception to this pattern is the path linking students' fifth-grade mathematics self-efficacy beliefs to their eighth-grade teachers' evaluations of their mathematics ability. While this path is positive and statistically significant, the effect is of only modest magnitude ($\beta = .075$).

Our examination of literacy and math test score outcomes reveals counterintuitive negative associations between third-graders' domain-specific academic self-efficacy beliefs and their corresponding test performance in fifth grade, though these coefficients are very small. Further, we observe no significant associations between fifth-graders' literacy or mathematics self-efficacy beliefs and their test performance in eighth grade, net of other model associations. In sum, then, we not only fail to find a pattern consistent with the hypothesized scenario in which non-Latino black, Latino, and Asian students demonstrate markedly weaker positive associations between academic self-efficacy and performance than non-Latino white students, but we fail to find consistent evidence that such associations exist for any group.

> **Hypothesis 2.** Our second hypothesis posits that, as members of negatively stereotyped groups begin to experience performance declines as a consequence of performance burdens, these students cope with negative evaluative feedback by discounting the information's relevance to their academic self-efficacy beliefs (Morgan & Mehta, 2004). Thus, we expect to observe weaker associations between academic performance and subsequent academic self-efficacy beliefs among Latino and African American students than among non-Latino white or Asian students.

Overall, SEM results suggest that academic performance feedback in the form of test scores and teacher evaluations tends to be positively associated with students' subsequent academic self-efficacy. Students' literacy and math test scores in third grade are both significantly and positively associated with their domain-specific academic self-efficacy beliefs as fifth graders (β_{Literacy} = .214; β_{Math} = .088). Unlike test performance, however, third-graders' teacher evaluations were not significantly predictive of their fifth-grade self-efficacy beliefs, net of model controls. While fifth-graders' test performance is not associated with their eighth-grade self-efficacy beliefs in the literacy domain, there is a significant and positive association between fifth-grade math performance and eighth-grade math self-efficacy beliefs (β = .101). The SEM results further suggest that teacher evaluations of fifth-grade students' literacy ability are predictive of students' literacy self-efficacy beliefs in the eighth grade (β = .106), though no such link exists in the math domain.

We hypothesize that each of these associations should be weaker among members of negatively stereotyped groups. However, allowing such variation in the model's path coefficients did not reveal a coherent pattern consistent with this expectation. On the one hand, relaxing equality constraints on the link between third-grade reading test performance and fifth-grade literacy self-efficacy for African American students revealed a slightly weaker association among African American students (β = .206) than white students (β = .214), though this difference is not so large that we regard it as substantively meaningful. Similarly, model results indicate that the association between fifth-grade math achievement and eighth-grade mathematics self-efficacy is not significantly different from zero among African Americans, while a significant, positive association exists among other students. On the other hand, African American students demonstrate a significantly *stronger* association between their third-grade math performance and their subsequent mathematics self-efficacy beliefs than non-Latino white students. Latino students, too, demonstrated a stronger association than non-Latino whites between test performance and subsequent academic self-efficacy beliefs in the literacy domain at the fifth-grade observation wave. Our conclusion, then, is that the SEM results do not provide support for our second hypothesis, as prior academic performance tends to be equivalently predictive of subsequent academic self-efficacy regardless of students' ethnoracial identity. Exceptions to this pattern of path coefficient equivalence do not follow the coherent pattern of weakened associations among negatively stereotyped groups predicted by theories of academic disidentification.

DISCUSSION

Education researchers continue to make progress toward a nuanced under-standing of the sources and consequences of academic stratification. Much of this work focuses on students' differential access to home and school resources known to scaffold cognitive development and academic achieve-ment. This is a crucial research endeavor, as accurate, exhaustive identifica-tion of the axes along which academic stratification arises must necessarily precede attempts to map these inequalities' etiologies. On the latter front, sociologists have devoted considerable attention to the mechanisms linking structural conditions with academic performance. Social psychological per-spectives provide appealing explanations for persistent ethnoracial, gender, and socioeconomic achievement gaps, identifying individual-level processes that connect students' academic attitudes and self-perceptions to their broader social contexts.

We examined a set of such explanations for ethnoracial achievement disparities, extending prior work on academic identity formation, stereo-type-linked performance burdens, and academic disidentification in multi-ple ways. Whereas most prior examinations of these processes focus on black−white comparisons among high school or college-aged students (Morgan & Mehta, 2004; Osborne, 1997; Steele & Aronson, 1995), we applied these perspectives to other historically disadvantaged (i.e., Latino) and more advantaged (i.e., Asian) ethnoracial groups, and examined the relationships between academic performance and academic self-efficacy across earlier life course stages. In addition, we incorporated domain-specific measures of academic self-efficacy, aligning our measures with con-temporary theoretical conceptions of the self rather than the aggregate or generalized academic self-efficacy indices used in the bulk of previous research (Marsh, 1992; Pajares, 1996).

The results of our analysis did not support our hypotheses. We found no coherent ethnoracial pattern of disrupted academic self-efficacy-achievement relationships among ethnoracial minority elementary and middle school students. Thus, our findings suggest that these social psycho-logical processes, which have historically been studied among African American late-adolescents and young adults, may not be generalizable beyond that population and those life course stages.

We propose three explanations for our null findings. Foremost, and as described above, necessary conditions for the activation of stereotype-driven social psychological processes include the development of an ethnic identity and awareness of negative intellectual stereotypes associated with

that identity. Put simply, it may be the case that the children who made up the ECLS-K sample, being eight through nine years old at the third-grade wave, were too young to experience the negative implications of ethnoracial academic stereotyping. In Cross's (1994) terms, these students may have remained in the "pre-encounter" stages of racial identity acquisition for the bulk of the ECLS-K's study window, having yet to develop a racial identity informed by and in opposition to negative stereotypes. Additionally, Blau (2003) explains that, in contrast to non-Latino whites who are more likely to interpret low academic performance as an indication of intrinsically low ability, some minority communities actively work to buffer such feelings among children, thereby decreasing minority children's likelihood of internalizing a racialized coding of ability.

Alternatively, stereotype-linked processes may be at play among ECLS-K participants; however, observable effects accumulate so slowly as to not emerge until students are beyond the eighth grade. As described above, academic disidentification is a form of psychological self-defense, guarding students' self-perceptions against negative external evaluations. Disidentification originates in developmental feedback loops, wherein negative feedback begets decreased motivation and lower subsequent performance, leading to additional negative feedback and so on until the psychological threat associated with negative external evaluations becomes severe enough to trigger students' discounting of external appraisals or rejection of the student role entirely. If this spiraling process does not typically come to a head prior to students' high school years, future researchers would do well to conceptualize and test for evidence of *pre*-disidentification among elementary and middle school students in the effort to identify social psychological mechanisms leading to racial and ethnic disparities in academic achievement.

Lastly, the empirical equivalence of these attitude-achievement relationships across children from diverse ethnoracial groups may reflect differences in the composition of their comparison groups. As self-perception research has long demonstrated, individuals often form their appraisals in relation to members of a local comparison group as opposed to broader society (Davis, 1966), a phenomenon that may be especially pronounced among younger individuals (Rosenberg & Simmons, 1971). When considered alongside the high levels of ethnoracial segregation that typify U.S. neighborhoods and public schools, this suggests that the children surveyed by the ECLS-K were likely to form their academic self-efficacy beliefs through intraethnic comparisons and not with respect to the more diverse, complete population of elementary students. Relatedly, youth and adults in

segregated schools may be especially unlikely to express negative academic stereotypes, further insulating young children from their damaging effects (Tyson, 2002).

It is important to append certain caveats to our results. Our longitudinal estimates hinge on lagged effects spanning two years for fifth-grade outcomes and three years for eighth-grade outcomes. While our longitudinal approach improves our estimates of the associations between academic self-efficacy and academic performance, it is possible that these estimates are overly conservative. Two- and three-year gaps between measurement occasions are not unusual in large panel studies. However, it may be the case that the number and magnitude of academic and developmental transitions students experience during these unobserved periods could introduce measurement error to the relationships we investigated, chipping away at the estimated associations and inflating standard errors. In the absence of comparably representative data measuring academic performance and academic self-efficacy using more closely spaced measurement occasions, we therefore present our findings with the acknowledgment that our tests set a conservatively high bar for the detection of significant longitudinal associations and ethnoracial moderation thereof.

Our analysis also relies on pan-ethnic identifiers to categorize Latino and Asian students, an analytic decision driven by sample size constraints that may consequently mask important intraethnic variation in academic attitudes and outcomes. Future work that is more tightly focused on specific ethnic communities may be better suited to identifying the reciprocal relationships among academic performance indicators and children's evolving self-perceptions, in addition to cross-community variations in these associations.

Devoting continued attention to the mechanisms underlying racial and ethnic inequalities in education is an important goal, particularly in an increasingly diverse society in which technical skills and educational credentials are growing ever more crucial to the status attainment process. The present study represents a step toward that goal by applying social psychological perspectives that have previously been used to explain achievement gaps between older white and minority students to the population of U.S. elementary and middle school-aged children. While achievement gaps are observable among children at the earliest stages of formal schooling, our results suggest that ethnoracial variation in academic self-efficacy formation and its bidirectional association with academic performance are unlikely to be central causes of these disparities.

NOTES

1. This longitudinal probability weight (C567CW0) also corrects for children's unequal sample selection probabilities, and returns estimates from later waves of the ECLS-K to being representative of the original 1998 U.S. kindergarten cohort.

2. This analytic decision is informed by the fact that non-Latino whites make up the largest segment of the student population, and should not be interpreted as an assertion that statistical relationships observed among non-Latino white students are in any sense more "normal" or "natural" than empirical values or patterns observed among other student groups.

ACKNOWLEDGMENTS

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APPENDIX

Table A1. Factor Loadings for Self-Efficacy and Teacher Evaluation.

	Loading	SE		Loading	SE
Reading self-efficacy third grade			Math self-efficacy third grade		
I am good at reading	1.000	.000	I am good at math	1.000	.000
I get good grades in reading	.956	.038	I get good grades in math	.894	.022
Work in reading is easy for me	.971	.035	Work in math is easy for me	.951	.025
Reading self-efficacy fifth grade			Math self-efficacy fifth grade		
I am good at reading	1.000	.000	I am good at math	1.000	.000
I get good grades in reading	.936	.022	I get good grades in math	.897	.020
Work in reading is easy for me	.933	.021	Work in math is easy for me	1.031	.019
Reading self-efficacy eighth grade			Math self-efficacy eighth grade		
I get good grades in English	1.000	.000	I get good grades in Math	1.000	.000
English is one of my best subjects	.892	.037	Math is one of my best subjects	1.085	.039
Teacher reading eval. third grade			Teacher math eval. third grade		
Conveys ideas clearly when speaking	1.000	.000	Creates and extends patterns	1.000	.000
Uses various strategies to gain information	1.138	.023	Uses a variety of strategies to solve math problems	1.194	.019
Reads fluently	1.175	.025	Recognizes properties of shapes	1.022	.021
Reads third-grade books independently	1.348	.029	Uses measuring tools accurately	.991	.022
Composes multi-paragraph stories/reports	1.230	.028	Shows understanding of place value	1.032	.020
Rereads and reflects on writing	1.167	.025	Makes reasonable estimates of quantities	1.112	.021
Makes mechanical corrections when reviewing	1.109	.025	Surveys, collects, and organizes data into graphs	1.069	.022
			Models, reads, writes, and compares fractions	1.033	.025
Teacher reading eval. fifth grade			Teacher math eval. fifth grade		
Conveys ideas clearly when speaking	1.000	.000			
Understands and interprets a story read aloud	1.043	.018	Subtracts numbers that need regrouping	1.000	.000
Uses various strategies to gain information	1.153	.024	Reduces fractions to lowest common denominator	1.582	.082

Reads fluently	1.130	.025	Demonstrates money management skills	1.366	.089
Reads and comprehends expository text	1.203	.025	Uses measuring tools accurately	1.303	.062
Rereads and reflects on writing	1.100	.024	Shows understanding of place value	1.465	.062
Makes mechanical corrections when reviewing	1.042	.026	Uses strategies to multiply and divide	1.620	.077
			Divides multi-digit problems with remainders	1.655	.069
			Demonstrates algebraic thinking	1.588	.076
Teacher reading eval. eighth grade			Teacher math eval. fifth grade		
Ability to organize ideas logically and coherently	1.000	.000	Applies math concepts to "real world" problems	1.000	.000
			Completes or conduct proofs of math reasoning	1.038	.015
Ability to employ conventions of grammar	.997	.010	Talks about reasoning or thinking in solving a problem	1.014	.020
Ability to gather and use information for research	1.028	.013	Explains reasoning in solving a problem in writing	1.075	.019
Ability to write various types of compositions	1.058	.011	Uses representations to model math ideas	.981	.019
Ability to use stylistic and rhetorical aspects	1.047	.014	Uses a calculator to solve problems	.711	.018
Ability to employ spoken grammar	.740	.014			
Ability to express analytical or critical thinking	.918	.016			
Ability to express creative thinking	.848	.016			