



Academic Motivation and Self-Regulated Classroom Behaviors in Middle Childhood: Moderation by Parental Education

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Abstract

We examined how students' intrinsic and extrinsic academic motivation and parental education uniquely and interactively related to teacher report of their self-regulated classroom behaviors (e.g., completion of tasks, keeping track of instructions). In a socioeconomically and racially/ethnically diverse sample of 317 students in third through fifth grade from the United States (34% Asian/Pacific Islander, 32% Hispanic/Latine, 21% White, 6% Black, 6% multiracial/other; 52% female), neither intrinsic motivation nor extrinsic academic motivation emerged as a significant predictor of children's self-regulated classroom behaviors when controlling for parental education. However, we found a significant interactive effect between intrinsic motivation and parental education for three complementary measures of students' self-regulated classroom behaviors (task orientation, working memory, flexible shifting). Simple slope analyses revealed that the positive association between intrinsic motivation and students' self-regulated classroom behaviors was limited to children whose parents have lower levels of educational attainment (e.g., high school degree). This work has important practice and policy implications for increasing classroom practices that promote students' academic intrinsic motivation, particularly for students whose parents have a high school degree or less. Simple interventions to improve teachers' autonomy-supportive classroom practices and the content of verbal and written feedback to students could have cascading benefits for students' intrinsic motivation and the self-regulated classroom behaviors that support learning.

Keywords Academic motivation · Intrinsic motivation · Extrinsic motivation · Self-regulated classroom behaviors · Parental education

Highlights

- Examined how students' intrinsic and extrinsic motivation and parental education uniquely and interactively relate to self-regulated classroom behaviors.
- Main effects of intrinsic motivation, extrinsic motivation, and parental education were non-significant.
- Significant interaction between intrinsic motivation and parental education for children's self-regulated classroom behaviors.
- Benefits of intrinsic motivation for self-regulation in the classroom were limited to students whose parents had a high school degree or less.
- Implications for increasing autonomy-supportive and feedback classroom practices to support intrinsic motivation.

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The current study explores whether associations between academic intrinsic and extrinsic motivation and self-regulated classroom behaviors are moderated by students' parental educational attainment. When students are motivated, they persist, feel self-confident, and focus on learning activities (Karlen et al., 2019; Waterschoot et al., 2019). Motivation drives the kinds of tasks students pursue, the criteria they use to determine if they accomplished them, and their level of persistence in achieving them (Schunk &

DiBenedetto, 2020; Zimmerman & Schunk, 2011). Academic intrinsic motivation, the desire to engage in school activities for enjoyment and learning (Ryan & Deci, 2020), has been positively linked to academic achievement (Ahn et al., 2021; Froiland & Oros, 2014; Karlen et al., 2019; Taylor et al., 2014). Some work shows that academic intrinsic motivation is also related to higher persistence and engagement in the classroom (Bugler et al., 2015; Howard et al., 2021). Separately, academic extrinsic motivation, engaging in school activities for external incentives or rewards such as praise and grades, generally has a negative association with academic achievement (Becker et al., 2010; Howard et al., 2021; Karlen et al., 2019). For this study, we conceptualize academic motivation as a malleable internal mindset that is relevant for how children behave and engage in the classroom setting.

Less is known about how intrinsic and extrinsic academic motivation uniquely relate to children's self-regulation in the classroom, as indexed by adaptive behaviors that support learning, such as remembering rules, following directions, and completing tasks independently. Self-regulated classroom behaviors encapsulate children's abilities to apply their cognitive and emotional regulation skills in the classroom context (Finders et al., 2021; Isquith et al., 2013) and are key predictors of academic achievement in elementary school (e.g., Chang & Gu, 2018; Graziano et al., 2016). Children who are more intrinsically motivated may be more likely to engage their self-regulation skills in the classroom to learn as much as they can (Ryan & Deci, 2020; Skaalvik et al., 2015).

While research on academic motivation in the past decade has successfully included children from diverse socioeconomic backgrounds (e.g., Corpus & Wormington, 2014; Froiland & Oros, 2014; Pascoe et al., 2018), these studies have not examined whether the association between academic motivation and school outcomes varies by parental education, an aspect of socioeconomic status (SES). Academic motivation may serve as an index of additional advantage for students from high-SES families (King & Trinidad, 2021) or, alternatively, motivation could serve as a protective factor for students from low-SES families by buffering against the negative effects of low SES for students' classroom behaviors (Chen et al., 2018; Sisk et al., 2018). The present study investigates the unique and interactive associations of students' academic motivation and parental education with teacher report of students' self-regulated classroom behaviors in an ethnically/racially and economically diverse sample of upper elementary school students from the United States. This work focuses on the middle childhood period that represents an academic and developmental transition marked by increased expectations for children to regulate their attention and behaviors in the classroom (Annie E. Casey Foundation, 2010; Felton & Akos, 2011).

Importance of Academic Motivation for School Success

Academic motivation encompasses students' attitudes, beliefs, perceptions, interests, and values that are associated with school success (Ryan & Deci, 2020; Taylor et al., 2014). While early research had students indicate whether they were intrinsically *or* extrinsically motivated to complete a task (Harter, 1981), more recent research emphasizes that they are not mutually exclusive. Although intrinsic and extrinsic motivation are negatively correlated, the correlation is very low and often non-significant (Lemos & Veríssimo, 2014; Lepper et al., 1997). Cluster analyses of upper elementary school and middle school students demonstrated that approximately a third of students report high levels of *both* intrinsic (e.g., "I ask questions in class because I want to learn new things") and extrinsic (e.g., "I answer questions because the teacher will be pleased with me") motivation for their schoolwork (Corpus & Wormington, 2014; Hayenga & Corpus, 2010). Thus, it is important to measure intrinsic and extrinsic motivation independently to capture the full range of students' reasons for engaging in schoolwork (Bear et al., 2017; Lemos & Veríssimo, 2014).

Studies generally show a positive association between students' academic intrinsic motivation and their school success, as indexed by achievement test scores and school grades, and a negative association between students' extrinsic motivation and academic outcomes (Ahn et al., 2021; Taylor et al., 2014). Correlational analyses have demonstrated that low-income, racial/ethnic minority students who report being intrinsically motivated to complete academic work receive higher grades than students who report being extrinsically motivated in elementary school (Broussard, 2004). Similarly, Kanonire and colleagues (2022) found that when measured separately, intrinsic motivation was positively correlated with reading performance, and extrinsic motivation was negatively correlated with reading performance, even after controlling for prior reading skills, in a large sample of Russian primary school students. In comparison to students with high extrinsic motivation (regardless of their level of intrinsic motivation), a combination of high intrinsic motivation and low extrinsic motivation is associated with better performance on achievement tests and better school grades (Corpus & Wormington, 2014; Hayenga & Corpus, 2010). This suggests that school success is not solely determined by the level of intrinsic motivation, but that it is crucial to also incorporate measures of extrinsic motivation into analyses.

Self-Regulated Classroom Behaviors

Self-regulation is the ability of individuals to adapt their behaviors, attention, and emotions to the needs of the

task at hand (Cole et al., 2019). It is a broad construct that includes both cognitive and behavioral regulation and captures the fit between the child's behaviors and the demands of their frequently changing environment via report of their use of self-regulatory strategies in everyday life (Finders et al., 2021; McCoy, 2019). In the classroom, children demonstrate their self-regulation through their abilities to independently complete tasks, ignore distractions, and quickly adapt to unexpected situations. Teachers can provide a unique perspective on how students' self-regulation skills are applied in the classroom context using rating scales (McCoy, 2019; Obradović et al., 2018). A robust literature shows that ratings of children's self-regulated behaviors are important predictors of academic achievement (e.g., Clark et al., 2010; Graziano et al., 2016; Thorell et al., 2013), even after controlling for direct assessments of children's executive functioning skills (Fuhs et al., 2015; Sulik & Obradović, 2018). Self-regulated classroom behaviors may be particularly important in middle childhood, when students face increased expectations to complete classroom tasks independently, transition between activities without adult support, and keep track of teachers' multi-step instructions (Jones et al., 2017; Rimm-Kaufman et al., 2009).

A few studies have linked academic intrinsic motivation to measures of self-regulated classroom behaviors that support positive schooling outcomes. In middle school students, intrinsic motivation has been associated with self-reported cognitive strategy use, self-regulation, effort, and persistence, even after controlling for students' grades (Skaalvik et al., 2015). A randomized control trial with fourth- and fifth-grade students identified a link between academic motivation and on-task behaviors (Cordova & Lepper, 1996). Specifically, when students played a game that was personalized and included choices, they demonstrated increased intrinsic motivation and displayed better on-task behaviors, compared to children who played the game without personalization and choice (Cordova & Lepper, 1996; Pintrich & de Groot, 1990). In elementary school students, intrinsic motivation has also been associated with less procrastination on homework and more out-of-school reading hours (Becker et al., 2010; Guthrie et al., 1999; Katz et al., 2014). Finally, in a sample of seven-year-olds born preterm and at risk for learning difficulties, the link between intrinsic motivation to literacy achievement was mediated by direct assessments of children's self-regulation skills (Pascoe et al., 2018). Therefore, one mechanism explaining associations between intrinsic motivation and school success is children's self-regulated behaviors, such as inhibiting impulsive behaviors and displaying on-task behaviors.

Academic Motivation, Parental Education, and Self-Regulated Classroom Behaviors

It is important to examine how students' academic intrinsic and extrinsic motivation independently contribute to self-regulated classroom behaviors, after controlling for SES, given strong evidence of socioeconomic inequalities in teacher report of self-regulated classroom behaviors (Rimm-Kaufman et al., 2009; van Tetering et al., 2018). While most extant work has focused on how poverty undermines development children's self-regulation development (Li et al., 2017; Palacios-Barrios & Hanson, 2019), a handful of studies have suggested that parental educational attainment may be uniquely important for children's self-regulation skills (Conway et al., 2018; van Tetering et al., 2018; Waters et al., 2021). Theoretically, family income likely works through material investments in children's education, whereas parental education is linked to child outcomes via parenting behaviors and beliefs about their children's academic success (Davis-Kean et al., 2021; Elliott & Bachman, 2018). Based on previous research, intrinsic motivation likely has a unique positive association with self-regulated classroom behaviors, after controlling for extrinsic motivation and SES (Corpus & Wormington, 2014; Lepper et al., 2005; Taylor et al., 2014). Academic intrinsic motivation drives students' interest, which helps them focus their attention, persevere on difficult tasks, and engage in classroom activities regardless of their family SES. Separately, extrinsic motivation is most likely to have a negative association with self-regulated classroom behaviors, after controlling for intrinsic motivation and SES (Hayenga & Corpus, 2010; Lepper et al., 2005). Therefore, academic intrinsic and extrinsic motivation could independently contribute to self-regulated classroom behaviors, after controlling for parental education.

Further, it is plausible that academic motivation is differently related to self-regulated classroom behaviors as a function of students' family SES, with two competing hypotheses on the nature of this interaction due to the lack of consensus in the literature. First, the relation between academic intrinsic motivation and self-regulated behaviors might be stronger for students from high-SES families (Cunha et al., 2006). Empirical support for this hypothesis can be found in studies of growth mindset, which captures children's beliefs that intelligence is malleable and has been linked to greater intrinsic motivation (Wigfield et al., 2021). For example, in a sample of U.S. high school students, growth mindset was only linked to school engagement and math achievement for students from high-SES households (King & Trinidad, 2021). Similarly, in a sample of Filipino secondary school students, growth mindset was only associated with mathematics and science achievement for students from high-SES families (Bernardo, 2021). These

studies provide some evidence that for adolescents, growth mindset may only benefit academic achievement if students already have access to meaningful educational resources and learning opportunities as indexed by their family SES.

Alternatively, the relation between academic intrinsic motivation and self-regulated behaviors might be stronger for students from low-SES families. High levels of academic intrinsic motivation may serve as a protective factor by supporting self-regulated classroom behaviors in students from lower-SES families. In a sample of Chilean secondary school students, growth mindset was more strongly linked to achievement for lower-SES students (Claro et al., 2016). Evidence from Chinese middle school students demonstrated that the association between learning motivation (including both intrinsic and extrinsic motivation for school) and reading ability was stronger for students from lower-SES households (Chen et al., 2018). Building on these studies, a meta-analysis found that growth mindset interventions only significantly improve the academic performance of students from low-SES households, and not of those in middle- to high-SES households (Sisk et al., 2018). These studies suggest that motivation may serve as a protective factor for the academic success of children from low-SES households by potentially helping them maximize their engagement with limited educational resources and opportunities. Given educational practices and policies aimed at promoting students' motivation (Ahn et al., 2021; Patall & Zambrano, 2019; Tessier et al., 2010), it is important to understand whether two aspects of motivation relate to learning-relevant classroom behaviors differentially by parental educational attainment. This would help us in identifying which students can potentially benefit most from educational interventions to support children's academic motivation and school success.

Current Study

To our knowledge, this exploratory study is the first to examine whether associations between academic intrinsic and extrinsic motivation and self-regulated classroom behaviors differ by elementary students' family SES, as indexed by parental education. We used a sample of 317 socioeconomically diverse third-, fourth-, and fifth-grade students. Teachers reported on students' self-regulated behaviors in the classroom (task orientation, working memory, flexible shifting), students reported on their own academic motivation, and parental education was drawn from administrative records. We first examined whether academic intrinsic and extrinsic motivation were related to students' self-regulated classroom behaviors, after controlling for parental education. Academic intrinsic and extrinsic motivation were conceptualized as internal mindsets (e.g.,

why children work hard) that would have implications for children's observable classroom behaviors (e.g., completion of tasks). This conceptualization of predictor and outcome variables is informed by prior work demonstrating the importance of motivation for children's school success (Cordova & Lepper, 1996; Katz et al., 2014; Pascoe et al., 2018). We hypothesized that academic intrinsic motivation would be positively associated with self-regulated classroom behaviors and that academic extrinsic motivation would be negatively associated with self-regulated classroom behaviors. Second, we explored whether parental education moderated the association between academic intrinsic motivation and self-regulated classroom behaviors and academic extrinsic motivation and self-regulated classroom behaviors during middle childhood while controlling for parental education. We tested the two competing hypotheses presented above, namely, whether the link between academic motivation and self-regulated classroom behaviors would be stronger for children from families with higher levels of parental education (Bernardo, 2021; Cunha et al., 2006; King & Trinidad, 2021) or lower levels of parental education (Claro et al., 2016; Sisk et al., 2018).

Method

Participants

Thirty-three third-, fourth-, and fifth-grade teachers and their students ($N = 317$, 52% female) from eight schools in the San Francisco Bay Area participated in this study. The present study utilizes a sub-sample from a larger study on the development of children's self-regulation skills in elementary school classrooms. Students were selected by the research team for additional teacher report based on parental consent for access to demographic data from school records (approximately 10 students per classroom). Children ranged in age from eight to twelve years old ($M = 9.86$, $SD = 0.87$). Our subsample was socioeconomically and racially/ethnically diverse. Of the parents in the study sample, 36% had a high-school education or less, 18% attended some college, 24% were college graduates, and 21% attended graduate school. Students were identified as 34% Asian or Pacific Islander, 32% Hispanic/Latine, 21% White, 6% African American/Black, and 6% multiracial or other.

Procedures

This study was conducted in the spring semester of the academic school year. Data were collected at the end of the academic year so that teachers could report on their students' classroom behaviors over the course of the school year. During a classroom visit, students completed a survey

to report on their intrinsic and extrinsic academic motivation. Teachers completed online surveys at home to report on their students' self-regulated classroom behaviors. Parental education was drawn from administrative data provided to the researchers by the school districts.

All study procedures were approved by Stanford University's Institutional Review Board and by the participating school districts and in accordance with APA ethical guidelines. We obtained a waiver of consent for the classroom-based assessments, including student self-report of motivation, and written parental informed consent to access administrative school records, including family demographic data. Teachers provided informed consent and reported on students' classroom behaviors. Each teacher received \$95 for participation in the study.

Measures

Intrinsic and Extrinsic Academic Motivation

Students completed the Intrinsic and Extrinsic Academic Motivation survey, a twelve-question paper-and-pencil survey about their levels of intrinsic ($\alpha = 0.74$) and extrinsic ($\alpha = 0.70$) academic motivation (see the Appendix for the full measure). They reported on both types of motivation (intrinsic and extrinsic) for working hard in the classroom and for doing homework (Developmental Studies Center, 2013). Students marked their responses on a 3-point scale (1 = *not a reason*, 2 = *a small reason*, and 3 = *a big reason*). For example, there are questions such as "When you work hard in this class, why do you usually do it?" To indicate their level of academic intrinsic motivation, students responded how much the statement "Because I want to learn as much as I can" was a reason for their classroom behavior. To indicate their level of academic extrinsic motivation, for the same questions, the students responded how much the statement "Because I want to get a good grade" was a reason for working hard in class. Research demonstrates that students as young as six can reliably report on their own motivation (Muenks et al., 2018).

Parental Education

Parents' self-reported highest level of education in years, drawn from administrative data, was used as a proxy for SES. The administrative data did not include information on family income or parental occupation. Specifically, a middle school education was set to be 8 years of education, a high school degree or GED was set to 12 years, some college or an Associate's degree was set to 14 years, a Bachelor's degree was set to 16 years, and a graduate degree was set to 18 years. In all analyses, parental education was used as a continuous variable.

Self-Regulated Classroom Behaviors

Three measures of children's self-regulated classroom behaviors were utilized to provide a comprehensive picture of children's abilities to focus, independently complete their classwork, keep track of assignments, and shift flexibly between competing demands. The *Task Orientation* subscale (5 items, $\alpha = 0.91$) from the Teacher-Child Rating Scale (TCRS; Hightower et al., 1986), measures children's abilities to focus and independently complete classwork on a five-point Likert scale (1 = *not at all* to 5 = *very well*). The *Working Memory* (4 items, $\alpha = 0.85$) and *Flexible Shifting* (4 items, $\alpha = 0.80$) subscales were selected from the Behavior Rating Inventory of Executive Function (BRIEF; Gioia et al., 2000) to measure children's abilities to complete tasks that have more than one step and fluidly change between activities and topics, respectively. Teachers reported on the items using a three-point scale (1 = *never*, 2 = *sometimes*, and 3 = *often*). Note that the BRIEF scales were reversed, such that higher values indicate better self-regulation skills.

Covariates

All models included student age, student gender (1 = *female*), and student race/ethnicity (Hispanic/Latine, Asian/Pacific Islander, White, Black/African American, and other/multiracial). Student age was included because older students typically report lower intrinsic motivation (Harter, 1981; Jacobs et al., 2002; Lepper et al., 2005). Gender was included because girls are rated to have better self-regulated behaviors compared to boys (Bugler et al., 2015). We included each of the different racial groups because significant racial differences have been found for intrinsic and extrinsic motivation (Lepper et al., 2005). Moreover, since parental education and race/ethnicity often covary, we wanted to isolate the link between parental education and students' self-regulated classroom behaviors.

Analytic Plan

Hierarchical linear modeling (HLM), also known as multi-level modeling, was conducted in Stata version 15 to estimate associations between academic motivation and parental education with each measure of children's self-regulated classroom behaviors. To adjust the parameter estimates and standard errors for the clustering of children within schools and classrooms, all models included random intercepts for classrooms and fixed effects for schools, which allow all estimates to be interpreted as "within-school" effects (Rabe-Hesketh & Skrondal, 2012). Directly modeling the nested nature of our data was our top priority when selecting an analytic strategy, as our outcome

measures are teacher-reported and both motivation and self-regulation skills may be impacted by shared aspects of the classroom context.

Model 1 tested whether intrinsic motivation and extrinsic motivation uniquely contributed to self-regulated behaviors, after controlling for parental education. Model 2 added an interaction term between academic intrinsic motivation and parental education and an interaction term between academic extrinsic motivation and parental education. The interaction terms tested whether the associations between intrinsic and extrinsic motivation, respectively, and self-regulated behaviors were moderated by parental education. Significant interactions between academic motivation and the continuous measure of parental education were probed by calculating and plotting simple slopes for children whose parents have a high school education and children whose parents have a college degree. The simple slopes were set to specific levels of education, instead of using ± 1 *SD*, to make the results more interpretable and policy-relevant. This is also why we conceptualized parental education as the moderator variable. We controlled for children's age, gender, and race/ethnicity in all models. Missing data cases were imputed through multiple imputation with 20 complete datasets using chained equations (Enders, 2017). Missing data for each variable is reported in Table 1 and the percentage of missing data ranged from 0% to 17%.

Results

Descriptive Statistics and Correlations

Descriptive statistics for all study variables are presented in Table 1 and bivariate correlations are presented in Table 2. Students reported relatively high levels of both intrinsic and extrinsic motivation ($M = 2.49$, $SD = 0.44$; $M = 2.35$, $SD = 0.46$, respectively). Intrinsic and extrinsic motivation were moderately correlated ($r = 0.29$, $p < 0.001$), suggesting that they are related, yet distinct constructs. Girls reported higher levels of intrinsic motivation than boys, but similar levels of extrinsic motivation. Black students reported higher levels of extrinsic motivation than students from all the other racial/ethnic groups. White students reported lower levels of intrinsic and extrinsic motivation than students from other racial/ethnic groups. Finally, parental education was uncorrelated with intrinsic motivation, but negatively associated with extrinsic motivation, such that students whose parents had higher levels of education reported lower levels of extrinsic motivation.

Intrinsic motivation was positively associated with teachers' reports of students' task orientation and flexible shifting. Parental education was positively associated with teachers' reports of students' task orientation and working

memory, but not flexible shifting. Teachers reported that older students demonstrated better working memory and flexible shifting in the classroom than younger students and that girls demonstrated more self-regulated behaviors than boys. Teachers also reported several racial/ethnic differences in self-regulated behaviors: they reported higher self-regulated behaviors for Asian/Pacific Islander students compared to other racial/ethnic groups, and lower levels of self-regulated classroom behaviors for Black/African American and Hispanic/Latine students compared to other racial/ethnic groups.

Regression Results

Regression results are presented in Table 3. Model 1 examined whether intrinsic motivation and extrinsic motivation uniquely contributed to self-regulated behaviors while controlling for parental education and demographic covariates. This model showed that neither intrinsic nor extrinsic academic motivation was associated with children's self-regulated classroom behaviors. There was a positive main effect of parental education on teacher-rated task orientation ($\beta = 0.150$, $p = 0.028$). However, Model 2 showed a significant interaction between students' intrinsic motivation and a continuous measure of parental education for all measures of students' self-regulated classroom behaviors (task orientation: $\beta = -0.186$, $p = 0.011$; working memory: $\beta = -0.210$, $p = 0.004$; flexible shifting: $\beta = -0.140$, $p = 0.046$), such that the association between intrinsic motivation and self-regulated behaviors was stronger for students whose parents had lower levels of education. The interaction between extrinsic motivation and family SES was not significant (task orientation: $\beta = 0.037$, $p = 0.587$; working memory: $\beta = 0.053$, $p = 0.438$; flexible shifting: $\beta = 0.095$, $p = 0.145$).

Simple slope analyses were conducted to probe the significant interactions between intrinsic academic motivation and parental education. Instead of using the typical ± 1 standard deviations (*SDs*), we decided to use more interpretable values of high school degree or General Education Diploma (GED; 12 years of education) and college degree (16 years of education.) As shown in Fig. 1, there was a positive association between intrinsic motivation and self-regulated behaviors for students whose parents' highest level of education was a high school degree or GED (task orientation: $B = 0.187$, $p = 0.005$; working memory: $B = 0.168$, $p = 0.008$; flexible shifting: $B = 0.214$, $p = 0.001$). Whereas the association between intrinsic motivation and self-regulated classroom behaviors for students whose parents attained a college degree, was not significant (task orientation: $B = -0.012$, $p = 0.857$; working memory: $B = 0.033$, $p = 0.591$; flexible shifting: $B = -0.016$, $p = 0.782$).

Table 1 Descriptive Statistics for All Study Variables

Variable	<i>N</i>	% Missing	<i>M</i> / %	(<i>SD</i>)	Min	Max
Intrinsic motivation	278	12.30%	2.49	(0.44)	1	3
Extrinsic motivation	278	12.30%	2.35	(0.46)	1	3
Self-regulated classroom behaviors						
Task orientation	315	0.63%	3.65	(1.12)	1	5
Working memory	315	0.63%	1.50	(0.57)	0	2
Flexible shifting	315	0.63%	1.54	(0.53)	0	2
Parental education (years)	262	17.35	13.84	(3.45)	8	18
Covariates						
Child age (years)	317	0.00%	9.86	(0.87)	8	12.29
Female child	317	0.00%	52.37%		0	1
White/Caucasian child	317	0.00%	21.45%		0	1
Black/African American child	317	0.00%	6.31%		0	1
Hispanic/Latine child	317	0.00%	31.86%		0	1
Asian/Pacific Islander child	317	0.00%	34.07%		0	1
Other/multiracial child	317	0.00%	6.31%		0	1

Table 2 Bivariate correlations among predictor and outcome variables and covariates

	1	2	3	4	5	6	7	8
1 Intrinsic motivation	—							
2 Extrinsic motivation	0.29***	—						
3 Task orientation	0.12*	−0.02	—					
4 Working memory	0.11	−0.03	0.80***	—				
5 Flexible shifting	0.14	−0.07	0.68***	0.64***	—			
6 Parental education	−0.10	−0.18**	0.15*	0.14*	0.00	—		
7 Student age	−0.05	−0.13*	0.05	0.18**	0.14*	0.07	—	
8 Female	0.13*	−0.04	0.32***	0.23***	0.18**	0.02	−0.07	—
<i>Student race/ethnicity</i>								
9 Black/African American	0.00	0.14*	−0.15**	−0.11	−0.19***	0.00	0.10	−0.01
10 Hispanic/Latine	0.03	−0.03	−0.12*	−0.14*	−0.12*	−0.33***	−0.05	−0.03
11 Asian/Pacific Islander	0.09	0.08	0.22***	−0.17**	0.29***	−0.06	−0.06	0.02
12 White/Caucasian	−0.15*	−0.15*	−0.05	0.01	−0.05	0.38***	0.13*	−0.04
13 Other/multiracial	0.00	0.02	0.03	0.02	−0.07	0.11	−0.11*	0.09

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Discussion

Academic intrinsic motivation has been mainly studied in relation to measures of academic achievement, such as test scores and grades, with little emphasis on children's classroom behaviors (Lepper et al., 2005; Taylor et al., 2014). We examined associations between academic motivation and students' self-regulated classroom behaviors, such as completing work without adult support and adapting to unexpected changes in the classroom. While academic intrinsic and extrinsic motivation did not have main effects on students' self-regulated classroom behaviors, we found that academic intrinsic motivation

served as a protective factor for self-regulated classroom behaviors of students whose parents have lower levels of education. For students whose parents have low levels of educational attainment only, intrinsic motivation was positively associated with all three measures of self-regulated classroom behaviors. In contrast, students from families with higher levels of educational attainment were reported to have relatively high self-regulated classroom behaviors regardless of their level of academic intrinsic motivation. Our findings suggest that high intrinsic motivation buffers against the negative effects of low SES for students' self-regulated classroom behaviors.

Table 3 Regression analyses predicting children's self-regulated classroom behaviors from intrinsic motivation and SES

	Task Orientation		Working Memory		Flexible Shift	
	Model 1 β / (SE)	Model 2 β / (SE)	Model 1 β / (SE)	Model 2 β / (SE)	Model 1 β / (SE)	Model 2 β / (SE)
Intrinsic motivation	0.074 (0.058)	0.093 (0.061)	0.072 (0.059)	0.096 (0.062)	0.085 (0.055)	0.110 (0.058)
Extrinsic motivation	-0.010 (0.059)	-0.046 (0.063)	-0.026 (0.060)	-0.069 (0.064)	-0.054 (0.057)	-0.089 (0.060)
Parental education	0.150* (0.068)	0.151* (0.068)	0.080 (0.070)	0.083 (0.070)	0.046 (0.069)	0.047 (0.070)
Intrinsic X parental education		-0.186** (0.072)		-0.210** (0.072)		-0.140* (0.070)
Extrinsic X parental education		0.037 (0.067)		0.053 (0.068)		0.095 (0.065)
<i>Covariates</i>						
Student age	0.081 (0.072)	0.069 (0.073)	0.170* (0.075)	0.154* (0.077)	0.110 (0.081)	0.100 (0.081)
Female student	0.593*** (0.101)	0.567*** (0.100)	0.445*** (0.101)	0.415*** (0.101)	0.369*** (0.094)	0.348*** (0.094)
Black/African American student	-0.366 (0.240)	-0.338 (0.237)	-0.383 (0.243)	-0.358 (0.239)	-0.662** (0.231)	-0.634** (0.230)
Hispanic/Latine student	0.212 (0.170)	0.227 (0.167)	0.061 (0.172)	0.083 (0.169)	0.106 (0.162)	0.122 (0.161)
Asian/Pacific Islander student	0.568*** (0.170)	0.620*** (0.169)	0.446** (0.173)	0.498** (0.171)	0.517** (0.165)	0.550*** (0.164)
Multiracial/other race student	0.253 (0.235)	0.250 (0.231)	0.243 (0.237)	0.241 (0.232)	-0.036 (0.222)	-0.038 (0.220)
N	317	317	317	317	317	317

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All models include school fixed effects. Intrinsic = intrinsic motivation, extrinsic = extrinsic motivation. Omitted racial /ethnic category = White/Caucasian

Moving beyond the notion that academic motivation is universally beneficial (Bugler et al., 2015; Ryan & Deci, 2020), our findings revealed that the association between academic intrinsic motivation and students' self-regulated classroom behaviors varied by parents' educational attainment. While there was not a main effect of intrinsic motivation on self-regulated classroom behaviors, we found that the positive association between intrinsic motivation and self-regulated classroom behaviors was stronger for students whose parents had less education. Specifically, the positive association between intrinsic motivation and self-regulated classroom behaviors was limited to children whose parents had lower levels of education. Thus, high academic intrinsic motivation acted as a protective factor for the self-regulated classroom behaviors of children from families with low levels of parental education. This aligns with previous work by Chen and colleagues (2018), who demonstrated that the association between motivation and reading skills was

stronger for Chinese middle school students from lower-SES families. Moreover, students from high-SES households are more likely to be exposed to high-quality environments and have access to resources that contribute to self-regulated classroom behaviors, regardless of their level of academic intrinsic motivation (Bassok et al., 2016; Davis-Kean et al., 2021; Rosen et al., 2020). For example, advantaged students are more often enrolled in enriching extracurricular activities that require them to follow instructions and to work independently (Ceci & Papierno, 2005).

Alternatively, the results could also be explained by biases in teachers' reports of their students' self-regulation skills. Prior studies show that teachers are more likely to rate students from low-SES families as having lower academic skills than they demonstrate on standardized achievement tests (Ready & Wright, 2011; Speybroeck et al., 2012) and that these biases can have lasting impacts on students' academic success (Ready & Chu, 2015). There

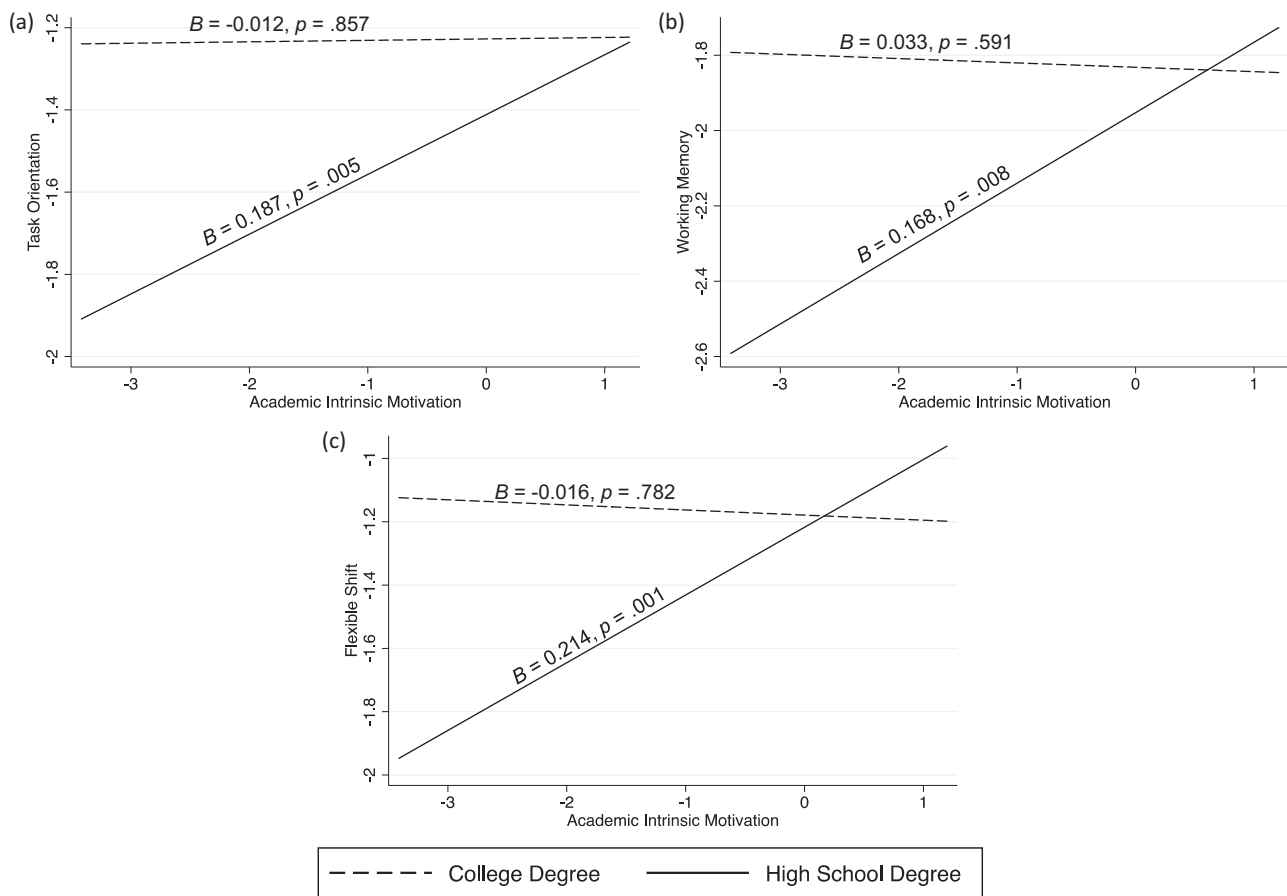


Fig. 1 Graph Depicting the Interaction between Parental Education and Motivation for Children's Self-Regulated Classroom Behaviors. Note. Interactions between academic intrinsic motivation and parental education such that the association between academic intrinsic motivation and (a) task orientation, (b) working memory, and (c) flexible

shifting are stronger for children whose parents have lower levels of education. Simple slopes represent high-SES (parental education of a college degree) and low-SES (parental education of a high school degree)

is also evidence of biases in teacher report of students' executive functioning skills by student gender, race, and English Language Learner status in this sample (Garcia et al., 2019), along with correlational evidence in the current study that teachers rate male students and those from racial/ethnic minority groups as having lower self-regulation than their peers. Teachers might perceive students from high-SES families as displaying more self-regulated classroom behaviors, regardless of their levels of academic intrinsic motivation, whereas they might be more influenced by the levels of intrinsic motivation expressed by students from low-SES families, as shown through their curiosity and engagement in the classroom. Students from lower-SES households are more susceptible to the effects of negatively biased teacher expectations (Hinnant et al., 2009; Sorhagen, 2013), so interventions to raise teacher expectations may be particularly impactful for disadvantaged students. A meta-analysis showed that teacher expectation interventions were successful at raising teachers' expectations of children's academic abilities through changing teachers' behaviors and

awareness of bias, and, in some cases, able to raise students' academic achievement (de Boer et al., 2018).

While the current study focuses on the role of parental educational attainment in moderating links between students' motivation and teachers' ratings of self-regulation behaviors, it is likely that students' racial/ethnic identity and gender also play a role in teachers' perceptions of students' behaviors and affect in the classroom. Indeed, we found that teachers rated girls and Asian/Pacific Islander students as having higher self-regulated classroom behaviors, compared to boys and students of other racial/ethnic identities. Moreover, our results showed that teachers rated Black/African American and Hispanic/Latine students as having lower self-regulation behaviors than their classmates of other races. Prior research demonstrates that teachers' own racial and ethnic identities play a role in how they perceive the behaviors and academic skills of students in their classroom (Rasheed et al., 2020; Redding, 2019), though less is known about how this intersects with SES and gender. Future research on the intersectionality between

household SES, students' racial/ethnic identity, and gender identity will be critical for understanding the complexity of teacher ratings of students' classroom self-regulation skills.

Implications for Teacher Practice and Classroom Experiences

When seeking to support the academic engagement and performance of disadvantaged students, it is crucial to target multiple levels of students' socio-cultural contexts, rather than just individual students' behaviors (Destin, 2020). Intrinsic motivation is malleable to students' experiences in the classroom (Patall & Zambrano, 2019; Roorda et al., 2011). Given that our study demonstrates that academic intrinsic motivation serves as a protective factor for students from low-SES families, it is important to design classrooms to support students' intrinsic motivation and comfort in undertaking challenges in their academic work. In the school environment, teachers influence students' academic motivation through their classroom practices and feedback delivery (Cents-Boonstra et al., 2020; Cheon et al., 2018; Martinek et al., 2016; Reeve & Jang, 2006).

It is well documented that intrinsic motivation decreases as children get older (e.g., Scherrer & Preckel, 2019), however age-related declines in intrinsic motivation can be partially explained by decreases in students' perceived autonomy support in the classroom (Martinek et al., 2016). Autonomy supportive classroom practices involve offering students meaningful choices in their learning experiences and opportunities for feedback, listening to student perspectives, and providing rationale for teacher requests (Cheon et al., 2018; Patall & Zambrano, 2019). Brief autonomy support interventions for teachers (1 to 3 h) have been successful at increasing autonomy supportive practices in the classroom (Su & Reeve, 2011) and improving students' intrinsic motivation (Guay et al., 2005; Tessier et al., 2010). Further, autonomy supportive classroom practices also improve students' perceived competence in the classroom which then has positive cascading benefits for students' intrinsic motivation and achievement (Ahn et al., 2021).

Verbal and written feedback also affects students' academic motivation (Mabbe et al., 2018; Reeve & Jang, 2006). When giving feedback on classroom tasks, teachers should validate students' emotions (e.g., "*I know this is a challenging task,*") to promote intrinsic motivation (Reeve & Jang, 2006). Research also demonstrates that students become more intrinsically motivated when they are praised for effort (e.g., "*You worked very hard at this task*") rather than their ability (e.g., "*You are really smart*") (Haimovitz et al., 2011; Koenka et al., 2019; Zentall & Morris, 2010). Simple changes in the focus of teacher feedback could have significant impacts on children's intrinsic motivation and

classroom behaviors, with stronger benefits for children whose parents have less educational attainment.

Moreover, teachers can directly support the development of students' self-regulation skills by clarifying and adapting their classroom routines and activities and improving the emotional climate of the classroom (Savina, 2021). Specifically, providing students with clear classroom organization, management, and routines helps them internalize self-regulation skills and is particularly beneficial for students with low self-regulation skills (Connor et al., 2010; Raver et al., 2011). Furthermore, self-regulation skills can be explicitly taught through learning activities and by providing students with strategies to improve their attention and resist distractions in the classroom (Bailey et al., 2019; Barnes et al., 2021). Finally, a warm and responsive classroom environment indexed by positive relationships between teachers and students and among students is consistently associated with students' self-regulation skills (Cadima et al., 2016; Yerdelen & Sungur, 2019).

It is critical that these classroom interventions are conducted in ways that are meaningful and intrinsically motivating to students from diverse and underserved backgrounds, including engagement with caregivers and the community to ensure that diverse values are reflected in children's educational settings. Autonomy supportive classroom practices and changes in feedback are unlikely to be beneficial if the classroom activities and assignments are not relevant and responsive to the needs of children from a range of cultural backgrounds (Kim et al., 2019). The foundation for culturally-relevant pedagogy and successful home-school and community-school connections are teachers' and administrators' cultural competence and care for students with socioeconomic and racial/ethnic backgrounds that differ from their own (Howard & Rodriguez-Minkoff, 2017). Once schools adopt these practices, they should establish meaningful connections with students' families to encourage teacher feedback and expectations to be mirrored in the home environment in ways that fit with families' diverse cultural values. Teachers can craft classroom activities that allow families' involvement and structure parent-teacher conferences as joint problem-solving sessions that include all perspectives on children's behaviors and learning (West-Olatunji, 2013).

Limitations, Future Directions, and Conclusions

Although our study represents a first attempt to look at the moderating role of parental education in the association between academic motivation and children's self-regulation in the classroom, there are several limitations to our study that need to be addressed in future work. First, we used student report of academic motivation and teacher report of students' self-regulated classroom behaviors. Future studies

should include direct assessments or observations to measure student academic motivation and self-regulated behaviors. Both student self-report measures and teacher ratings could have been influenced by the classroom climate and the quality of the teacher-student relationship. There is a need to design direct assessments of academic motivation that can be applied in a classroom setting. Second, we were only able to administer a few, abbreviated child survey measures, due to time constraints. In future studies, it would be important to examine whether the findings apply to other BRIEF subscales (such as planning/organization) and other aspects of children's self-regulation in the classroom. Third, parental education was used as a proxy measure of SES due to the lack of other SES measures in the school administrative data. Given research indicating that household income and parental occupational standing have unique effects on child development (Davis-Kean et al., 2021; Duncan & Magnuson, 2003), it will be important to examine these aspects of SES in relation to children's motivation and classroom behaviors. Fourth, this study also used a cross-sectional design. Future research should examine the longitudinal effects of motivation on children's classroom behaviors. It is crucial to explore if the compensatory benefits of high academic intrinsic motivation for low-SES students' self-regulated classroom behaviors are sustained as children transition to middle school. Moreover, there are likely bi-directional and interactive effects between children's academic motivation and self-regulation skills in the classroom. For example, in a sample of economically-disadvantaged students, growth mindset and self-regulation skills interactively predicted children's academic success (Townley-Flores et al., 2022). We encourage future research on the interplay between children's motivation and self-regulatory classroom behaviors, especially considering the socioeconomic context. Longitudinal cascade models would be particularly helpful in exploring how family SES may influence both self-regulation and academic motivation over time.

Overall, this study shows that parental education is a significant moderator of the association between academic intrinsic motivation and self-regulated classroom behaviors. Academic intrinsic motivation was protective against the negative effects of low parental education on three complementary measures of children's self-regulated classroom behaviors. Academic intrinsic motivation is malleable to teachers' classroom practices and feedback. Thus, our findings suggest that classroom-level supports to encourage students' intrinsic motivation might have cascading benefits on their self-regulated classroom behaviors, particularly for disadvantaged students.

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Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

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