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**Persistence Mindset among Adolescents:
Who Benefits from the Message that Academic Struggles are Normal and Temporary?**

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Abstract

Research proposing that mindset interventions promote student achievement has been conducted at a frenetic pace nationwide in the United States with many studies yielding mixed results. The present study explores the hypothesis that mindset interventions are beneficial for students only under specific circumstances. Using a randomized controlled trial with student-level random assignment within two public schools (School 1: $n = 198$ seventh-graders, 73% Black, 27% White, 53% male; School 2: $n = 400$ ninth-graders, 98% White, 2% Black, 52% male), this trial conceptually integrated elements from three evidence-based mindset interventions. It then examined two theoretically driven moderators of student performance following the transition to middle or high school: students' racial backgrounds and students' educational expectations. Results indicated that the intervention was effective for a particular subset of students—Black students with high educational expectations—resulting in higher grades over the course of the year. Among students with low educational expectations (regardless of race), the intervention did not impact grades. For White students with high educational expectations, the control activities actually benefitted grades more than the mindset intervention. Both theoretical and practical implications for mindset research are discussed.

Keywords: mindset intervention, adolescent, educational expectation, school transition, motivation and engagement

Persistence Mindset among Adolescents:

Who Benefits from the Message that Academic Struggles are Normal and Temporary?

Students experience a range of challenges and successes during their academic careers. However, research has long recognized that what matters for students' long-term academic trajectories is not just whether they succeed or fail, but also how they interpret and understand their failures when they occur. Research on attributions has suggested that failure may be ascribed to stable and internal causes (e.g., intelligence) or to changeable or temporary causes (e.g., effort; Weiner, 1985; Wilson & Linville, 1985). These attributions are critical because they in turn shape whether students stay engaged in the domain. If failure is perceived as a lack of effort rather than a lack of intelligence, then persistence can lead to a better outcome. On the other hand, if failure is attributed to a lack of intelligence, persistence may be seen as futile. As such, the mindsets students use to understand their own learning successes and failures influence how they subsequently behave in the relevant domain (e.g., persist or disengage). Consequently, mindsets have been found to predict students' long-term academic outcomes (Yeager & Dweck, 2012).

Critically, research has also suggested that mindsets are malleable and can be shaped by instructional interventions in ways that promote academic success. Indeed, a growing body of research has shown that brief, school-based mindset interventions can ameliorate declines in student engagement and increase academic performance (Blackwell, Trzesniewski, & Dweck, 2007; Lin-Siegler, Ahn, Chen, Fang, & Luna-Lucero, 2016; Walton & Cohen, 2011). For example, Blackwell and colleagues' (2007) growth mindset intervention showed that lessons about how intelligence grows similarly to muscles in the body helped middle school students attain better math grades compared to students in the control condition. Relatedly, participation

in a belonging mindset intervention teaching students that social and academic struggles are normal during school transitions predicted higher grade point averages across the college years (Walton & Cohen, 2011).

Despite the enthusiasm, mindset interventions currently face several significant barriers that limit their impacts at the individual or population level. First, a recent meta-analysis of the vast and growing mindset literature concluded that the effects of mindset interventions are not uniform or highly robust across contexts (Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018). In other words, what works in one study with one group of students has not always worked in other studies, and it is often unclear why. Second, mindset theory has been critiqued for being incomplete and without clear boundary conditions (e.g., Wood & Williams, 2013). That is, simply teaching students to adopt a growth mindset may not be enough to improve all students' academic outcomes. Given the promise of mindset interventions for helping students develop adaptive beliefs and stay engaged in learning, robust tests of mindset interventions are needed to understand when, for whom, and why mindset interventions promote academic achievement. Doing so may yield insights into psychosocial mechanisms that feed into innovations to make interventions more effective and scalable.

To address these limitations, the present authors conducted a multi-site randomized controlled trial of a mindset intervention while using theory to generate and test possible moderators of the intervention. This study was designed to provide a robust test of the idea that a low-cost mindset intervention could have a long-term effect on student grades, at least for some students, in three primary ways. First, the intervention was conducted during a critical school transition, a time when students may be most receptive to psychosocial interventions (see Cohen & Sherman, 2014). In School 1, the intervention followed students' transition to middle school

(seventh grade), while in School 2, it followed students' transition to high school (ninth grade). Second, this study sought to develop a more robust intervention protocol by integrating key ingredients from prior interventions into a single design (i.e., growth mindset, belonging mindset, and famous scientist struggle stories). Although several conceptually similar interventions have shown benefits of mindset and attributional training, very few studies have integrated the key ingredients of well-validated mindset interventions. Lastly, the present study drew a diverse sample and conducted repeated surveys of student characteristics to examine potential moderators of the intervention, including students' racial backgrounds and their expectations for educational attainment. Overall, this study aimed to elucidate the question of when, and for whom, persistence mindset interventions can be most effective.

Intervening Following the Transition to Secondary School

According to stage-environment-fit theory (Eccles et al., 1993), the transition from elementary to middle or high school presents numerous academic and social challenges. During school transitions, students typically move to larger schools that are less personal and more formal, and studies have suggested that adolescents often experience a mismatch between their developmental needs and the opportunities provided by their school environment, thus leading to decreased academic engagement (Eccles et al., 1993; Wang & Eccles, 2012). With the increasing curricular complexity and heightened academic demands of the new school environment, the experience of academic failure becomes more common for middle and high school students (Eccles & Roeser, 2011). These facts make the school transition a critical period that may be optimal for interventions that target adolescents' motivational beliefs. Intervention research has suggested that timing is essential to the intervention's success (Cohen & Sherman, 2014; Wang & Degol, 2014), and that carefully crafted, well-timed interventions have the potential to change

students' long-term academic trajectories (Goyer et al., 2017). It is therefore critical to help students manage the challenges associated with transitions and to do so early enough to prevent passing thoughts from becoming entrenched beliefs that undermine long-term academic success.

An Integrated Persistence Mindset Intervention

In addition to timing the intervention carefully, the present study also sought to maximize its impact by integrating distinct elements of previous mindset interventions into a single protocol. The intervention was situated within a more general framework concerning storytelling, structured writing tasks, and social narratives that are intended to provide cognitive scaffolding for how students perceive and understand their school experiences adaptively (Dweck, Walton, & Cohen, 2011; Walton, 2014; Wilson & Linville, 1985). In particular, three validated mindset interventions were integrated into a single protocol. The three approaches included (a) *growth mindset*, which focused on changing students' theories of intelligence to see it as malleable and "growable" with effort (Dweck, 2017); (b) *famous scientist struggle stories*, designed to change students' notions of success by showing them that failure is normal, even among successful celebrities and scientists, including successful people of color (Lin-Siegler, Ahn, et al., 2016); and (c) a *belonging mindset*, which helped students see doubts about their belonging in school as normal, common, but ultimately temporary (Walton & Cohen, 2007).

While the specifics of the various mindset interventions differ, they each aim to help students foster resilience in the face of inevitable setbacks and respond to adversity in ways that maintain or promote engagement and persistence. As such, each of these interventions can be viewed as different instances of a *persistence mindset intervention*. By integrating these intervention approaches, this study seeks to distill their shared psychological syntax and use that syntax as the basis for a narrative that weaves the interventions together.

Intervention approach 1: Intelligence mindset training. Implicit theory of intelligence research has repeatedly demonstrated the power of intelligence mindsets in shaping individual performance (e.g., Paunesku et al., 2015). Compared to people who believe intelligence is an inherited and unchangeable quality, people who believe intelligence is malleable have shown greater growth in their academic performance (Grant & Dweck, 2003; Romero, Master, Paunesku, Dweck, & Gross, 2014). Such research has suggested that a person's intelligence mindset impacts educational outcomes because it influences how students respond to adversity (e.g., a poorer-than-expected grade). When students believe that intelligence is fixed and stable, failure may be seen as an indication that they are not smart enough to succeed, resulting in disengagement from the domain. However, for students who hold growth intelligence mindsets, failure is not seen as an indictment on intelligence, but rather as an indicator of the need for more effort and growth. In their randomized controlled trial, Blackwell and colleagues (2007) showed that middle school students exposed to a growth intelligence mindset curriculum (e.g., an 8-week curriculum emphasizing that the brain forms new connections when it learns and that intelligence grows similar to how muscles grow) received better math grades following the intervention than students in the control condition.

Intervention approach 2: Struggle-story approach. Attribution theory posits that people's judgments about the causes of their own and other people's performance have important implications for performance (Weiner, 1985). Notably, people who credit their failures to insufficient effort are more likely to undertake difficult tasks and persist despite setbacks. In contrast, those who ascribe their failures in performance to uncontrollable factors, such as innate intelligence, display low achievement strivings and give up easily when encountering obstacles (Dweck, 2017). Researchers have demonstrated that teaching students the importance of effort

(versus ability) in order to increase performance and self-efficacy is essential for learning. For example, Lin-Siegler and colleagues (2016) used a struggle-story approach with a high school student sample to present stories during one instructional period of how accomplished scientists (e.g., Albert Einstein) fought through and overcame personal and intellectual challenges with effort and persistence. By dispelling the myth that science achievement requires exceptional talent, the researchers found that compared to students who received control content (i.e., focus on scientists' accomplishment and discoveries), those who received the struggle stories (i.e., focus on scientists' struggles and efforts to overcome adversity) showed improved science learning outcomes, with stronger intervention effects for low-performing students.

Intervention approach 3: Belonging mindset training. Humans have a fundamental need to belong and be accepted by other people (Baumeister & Leary, 1995; Ryan & Deci, 2000). Studies show that student performance is optimized when their need for belonging is met by an emotionally supportive and socially inclusive school environment (Eccles & Roeser, 2013). Concerns about belonging are at the core of why transitions to new social contexts can pose problems for an individual (Walton & Cohen, 2007). Importantly, academic transitions can be especially problematic for students from groups whose intellectual abilities are negatively stereotyped (e.g., Black students, first-generation college students). For these students, the experience of adversity in academic settings is subjectively different than for their non-stereotyped peers. For example, when stereotyped group members experience adversity (e.g., a lower than expected grade), there is a subjectively plausible attribution that can hamper persistence and academic success, such as, "Perhaps people with my background do not belong here." Note that such an attribution is reflective of a fixed intelligence mindset: If a student

suspects they possess an essential, unchangeable characteristic that limits success in a particular domain, they may be less likely to engage in that domain.

Researchers have sought to counter disengaging attributions with belonging mindset interventions. Such interventions convey a growth mindset message, but they focus more explicitly on the malleability of belonging. For example, brief (i.e., a one-time laboratory visit or a single online session) social belonging interventions in college settings (e.g., Walton & Cohen, 2007; Yeager, Walton, et al., 2016) have been employed to teach students that social and academic struggles during college are normal, temporary, and surmountable with persistence and patience. Results showed that students from historically underrepresented backgrounds—that is, students who likely have a disproportionate amount of belonging uncertainty—received particularly strong academic benefits from this intervention (Walton & Cohen, 2007; Yeager, Walton, et al., 2016). However, research has yet to apply this approach in secondary school settings.

Integration. The embedded messages within the growth mindset, struggle-story, and belongingness mindset interventions overlap in several important areas. Broadly, these messages all target the meaning that students make from their experiences with adversity in school. Each approach teaches students to attribute their adversity in school to universal, temporary causes (e.g., “It happens to everyone, and it will pass with time.”), while avoiding attributions to personal, stable causes (e.g., “I’m just not smart enough.”; see Walton, 2014). These approaches make adversity seem universal in the sense that anyone who is not prepared will not perform at their best (i.e., growth mindset); even really smart and successful people commonly experience failure along the way (i.e., struggle stories); and it is normal to have doubts about belonging on a new campus (i.e., social belonging). In addition, these interventions teach students to see

adversity as a *temporary* point on a positive growth trajectory. Thus, students embrace the mantras that intelligence can be developed through effort over time; accomplished people experience both success and failure along the way; and students' adjustment to their new school tends to improve with time. In this way, these interventions share a common psychological syntax in fostering universal, temporary attributions for adversity with the aim of increasing students' persistence and helping them reach their full academic potential.

Of course, these three intervention strategies also have significant differences, as they each use different conceptual referents (e.g., beliefs about intelligence, scientists, and belonging). This diversity in content is useful for creating different interest points for a diverse student body, and the shared psychological syntax makes these interventions ripe for integration. Considering each intervention through the lens of the other two reveals clear connections and directions for new strategies to increase student persistence. For example, having a fixed intelligence mindset (i.e., "either you have intelligence or you do not") can, in the face of failures and setbacks, lead to conclusions that one is not "cut out" for the domain and, ergo, that one does not belong. Moreover, belonging and intelligence mindsets are fundamentally connected in academic settings: The belief that intelligence can be grown promotes performance that can reinforce a sense of belonging, while a sense of belonging can reallocate psychological resources otherwise devoted to belonging-seeking toward performance. Furthermore, the struggle-story approach provides an engaging means through which students receive concrete examples of how normal and "okay" it is to fail before success. Taken together, these three interventions work toward the same end, thereby reinforcing and strengthening one another (see Aguilar, Walton, & Wieman, 2014).

Moderators of Mindset Interventions

Literature reviews and meta-analyses have shown that educational interventions are often more effective in certain subsets of students (Hattie, Biggs, & Purdie, 1996; Rosenzweig & Wigfield, 2016). In fact, a recent meta-analysis of the mindset literature found the effects of mindsets on educational outcomes to be generally weak, but theoretically consistent moderating factors were found (Sisk et al., 2018). Namely, students classified as academically at risk tended to show larger benefits from having growth mindsets. To expand the theoretical and empirical understanding of why and when mindset interventions may be most effective, the present research attends specifically to two theory-driven moderators of the intervention effect: race (i.e., whether the student is Black or White) and participants' educational expectations (i.e., the extent to which they believe that they can pursue higher education).

Race. Historically, Black students have been stigmatized as lacking the academic skills to be successful in school (Steele, 1992; Steele & Aronson, 1995), and this stereotype has contributed to persistent discrimination against Black students in school settings (McKown & Weinstein, 2008; Okonofua, Walton, & Eberhardt, 2016). The culmination of these experiences may justifiably result in a serious decline in Black students' sense of academic competence and perception of school belonging as they progress through the education system (Benner & Graham, 2009; Walton & Cohen, 2007). Given these challenges, Black students may be especially likely to benefit from interventions that affirm their ability to thrive and belong in educational settings. Supporting this idea, prior studies have found that belonging mindset interventions uniquely bolster Black college students' academic achievement (but not White students') (Walton & Cohen, 2007, 2011; Yeager, Walton, et al., 2016). Blackwell and colleagues' (2007) growth mindset intervention was also associated with better grades among a

primarily Black middle school sample, which could suggest that mindset interventions have unique benefits for Black students during the secondary school years.

Notably, although participants' race may be a potentially significant moderating variable, the mindset intervention itself does not draw explicit attention to participants' race or the idea of racial inequalities. Instead, it brought race and gender into the materials more obliquely in the struggle-story portion, in which several exemplars were either women or persons of color. The diverse backgrounds of the exemplars were not referenced explicitly but were conveyed through photographic depictions of the famous persons. In doing so, the intervention was intended to be tacitly relevant to all students without making any particular students feel singled out or targeted by the intervention (see Yeager & Walton, 2011).

Educational expectations for academic success. While several mindset intervention studies have examined students' prior academic achievement as a moderator (see Sisk et al., 2018), researchers have yet to fully understand the role of students' pre-existing attitudes toward school. These attitudes are noteworthy, given evidence about the import of beliefs about school for students' educational persistence (Eccles, 2009; Wang, Eccles, & Kenny, 2013). Growing evidence suggests that the effectiveness of mindset interventions depends in part on the pre-existing educational attitudes of students who receive them (Durik, Shechter, Noh, Rozek, & Harackiewicz, 2015; Rosenzweig & Wigfield, 2016). As such, understanding which student beliefs are conducive to producing positive intervention results is critically important for both theory and practice in mindset research.

The present study aims to conceptualize and test educational expectations for academic success as a moderator of mindset interventions. This approach follows prior insight that educational expectations can play a significant role in the efficacy of mindset interventions. For

example, a study on delivering effective feedback to a diverse student population identified a combination of two messages that maximally promoted student persistence (Cohen, Steele, & Ross, 1999; Yeager et al., 2014): Students in general and especially students of color showed the most persistence when given feedback that conveyed (a) assurances that they could succeed with effort (similar to growth mindset), and (b) high standards and expectations for success. A conceptually similar effect was seen in an intervention study that aimed to improve students' value of mathematics (Durik et al., 2015). This study found that students' math expectancy beliefs (e.g., "I consider math to be one of my best subjects.") were salient moderators of the intervention's effects. Specifically, only adolescents who viewed themselves as highly capable in math benefitted from the motivational messages of the intervention. Together, these studies point to expectations for success as a potential moderator of mindset interventions.

Current Study

The current intervention was informed by psychosocial theory and research suggesting that students' beliefs about themselves, their school environment, and the factors that contribute to academic success can influence their academic achievement (Lin-Siegler, Dweck, & Cohen, 2016). By reflecting on prior students' experiences and reading celebrities' and accomplished scientists' stories, the present intervention provides reassurance that challenges occur for *everyone* when they enter secondary school (as opposed to just particular student or groups) and that these challenges will usually resolve with effort and time. To this end, the present intervention tested the impact of the persistence mindset intervention on academic performance of students newly transitioning to middle or high school via a randomized controlled trial with student-level random assignment within two public schools. While the intervention was designed to be generally helpful to all students, it was expected to be most effective for particular subsets

of students. Specifically, the intervention message was expected to be especially impactful among students of color, who more often contend with harmful academic stereotypes and may therefore be more likely to see the intervention message as both relevant and reassuring. Furthermore, students in general, and particularly students of color, were expected to show meaningful variability in their educational expectations for the future. Since such expectations have been implicated as critical moderators in prior research, the present study therefore examined not just race but also educational expectations, and the intersection between race and expectations, as moderators of the mindset intervention.

Methods

Participants

Overview of participants. Participants were adolescents ($N = 598$) from two schools (herein referred to as “School 1” and “School 2”) in the Mid-Atlantic region of the United States during the 2016-2017 school year. These two schools expressed interest in implementing an intervention to increase academic achievement and became involved in an ongoing research partnership focused on student engagement. Although the schools were close in proximity, they varied demographically. School 1 was a Grade 7-12 public junior/senior high school. Seventh-grade students participated because it was a transition year to this school. The school was 64.5% Black, 31.5% White, and 1.8% two or more other races. Given that School 1 was part of a Title I school district, all students qualified for a free or reduced-price lunch. School 2 was a Grade 9-12 public high school. School 2’s student body was >95% White, 1% Black, and 4% other racial and ethnic backgrounds, with approximately 24% of students classified as economically disadvantaged. In this school, ninth-grade students were the focus of the current intervention study given that they were newly transitioning to the high school.

Inclusion criteria. There were several inclusion criteria for the present analytic sample. First, students had to have been assigned a treatment condition either at the pre-test survey or when they participated in the intervention ($n = 47$ excluded; some of these cases were false study IDs that students accidentally entered at a data collection wave). Second, students needed to have been in the same grade as their peers (seventh grade for School 1, ninth grade for School 2; $n = 15$ excluded). Third, students needed to have provided data in at least one of the three assessment surveys ($n = 8$ students excluded). Fourth, given the current study focus on racial comparisons, the sample was limited to Black and White students across these two schools ($n = 31$ students of other racial and ethnic backgrounds were excluded). Finally, given that statistical controls in place for math course information (as a proxy for course rigor and peer context), students needed to have their math course identified in the file ($n = 2$ students were excluded).

Analytic sample. Based on the inclusion criteria, the final analytic sample consisted of 598 adolescents at Schools 1 and 2. Participants in School 1 were a cohort of 198 seventh-grade students ($M_{\text{age}} = 12.90$ years, $SD = 0.58$) that was 73% Black, 27% White, and 53% male, with all students qualifying for free or reduced-price lunch. At School 2, participants were a cohort of 400 ninth-grade students ($M_{\text{age}} = 14.87$ years, $SD = 0.45$) that were 98% White, 2% Black, and 52% male. Approximately 20% of participants from School 2 were socioeconomically disadvantaged, as indicated by qualification for a free or reduced-price lunch.

Given the present interest in racial differences, several comparisons were planned. While no socioeconomic status data were available at School 1 (recall that all students qualified for a free or reduced-price lunch), all Black students had significantly lower grade point averages the prior year ($M = 2.53$) than White students ($M = 3.02$), $t(164) = -2.99$, $p = .003$, a factor that is often correlated with socioeconomic disadvantage. Black and White students did not vary in their

educational expectations, $t(146) = -1.45, p = .150$, or in whether they were in a low versus a standard or advanced math track, $\chi^2(1) = 2.12, p = .145$. Although there were too few Black students ($n = 7$) at School 2 to make valid comparisons to White students ($n = 393$), it was possible to examine potential differences between White students at School 1 and School 2 White students. White students at School 1 had significantly lower grade point averages ($M = 3.02$) than White students at School 2 ($M = 3.41$), $t(38.68) = -2.43, p = .020$. However, White students from School 1 and School 2 did not differ in their educational expectations, $t(396) = 0.17, p = .864$.

Procedure

Institutional Review Board approval. All study procedures were approved via the University of Pittsburgh Institutional Review Board. The present study received exempt status, as it was classified under the “Educational Strategies, Curricula, or Classroom Management Methods” category that is exempt. Teachers helped develop the intervention and administered all study procedures; thus, the intervention activities were similar to what students would typically experience in their classrooms. It should also be noted that the effectiveness of psychological interventions hinges on participants being unaware that they are in an intervention, as awareness can make participants feel targeted and lead to backfiring effects (Yeager & Walton, 2011). Thus, all students participated if they were present on the day of the research activities under the assumption that they were engaging in regular classroom activities.

Study procedures. The present study had five total data collection waves at each school, which included the following survey assessments and intervention activities: (1) pre-intervention survey assessment (School 1: September 14, 2016; School 2: September 12, 2016); (2) intervention (School 1: September 21, 2016; School 2: September 19, 2016); (3) booster

intervention (School 1: October 26, 2016; School 2: October 17, 2016); (4) post-intervention survey 1 assessment (School 1: November 30, 2016; School 2: November 14, 2016); and (5) post-intervention survey 2 assessment (School 1: March 22, 2017; School 2: March 9, 2017).

Following formal training from the research team at the beginning of the year (e.g., an overview about the study and scripts to introduce the activities), teachers administered all study activities. For School 1, teachers who led the “seminar” class, which was intended to build study and other organizational skills, administered all activities. For School 2, social studies teachers administered the intervention activities, while English, math, and science teachers each administered one survey assessment. Teachers framed the activities as regular classroom activities and were instructed not to mention that students were in a research study.

Each survey assessment and intervention took one full instructional period (approximately 45 minutes each), and all procedures were completed in the school’s computer labs via the online Qualtrics platform. Surveys included questionnaires on students’ school motivational beliefs (e.g., educational expectations) and school engagement (e.g., cognitive engagement). All questions were audio-recorded, and students were provided with headphones to proactively address any literacy issues.

Students were randomly assigned to a condition—either the persistence mindset intervention or the study skills presentation—at the individual level via the computerized randomizer in the Qualtrics platform. For the booster intervention, the students were assigned to the same condition (intervention or control) as they had been assigned in the first intervention. During both intervention waves, students were presented with the fully integrated persistent mindset intervention (i.e., struggle stories, school belonging, and intelligence mindset content integrated together) or the study skills control intervention. The booster presentation was similar

to the first intervention in its overarching themes, but included new struggle stories, student quotes, mindset intervention content, and writing activities.

Each dose of the intervention served a unique purpose: The first intervention served to introduce core messages during a crucial transition time (i.e., starting a new school), and the second intervention reinforced these messages after students had time to experience stressors and setbacks within their new school environment. The decision to include multiple intervention sessions was based on Blackwell and colleagues' (2007) seminal mindset intervention study with adolescents, which included multiple doses to strengthen the salience of the message (Blackwell et al., 2007). Across both interventions, teachers were given brief forms to rate their classrooms' level of engagement with the intervention content. At the end of the school year, students' achievement and demographic school record data were collected. Teachers were compensated for their assistance with the study activities.

Participation rates. Student participation rates were high across the five study waves: (1) pre-intervention survey = 89.3%; (2) intervention 1 = 91.5%; (3) booster intervention = 88.1%; (4) post-intervention survey 1 = 87.1%; and (5) post-intervention survey 2 = 87.3%. If students were absent the day of any scheduled data collection, these data were considered missing. Eighty-seven percent of students participated in at least four of the five study waves. Analyses examined if participation rates were associated with student characteristics. Students who participated in more waves had higher prior achievement ($r = .31, p < .001$) and were more likely to be male ($r = .09, p < .05$). Study participation was not correlated with being White versus Black ($r = .07$), being in a low versus a standard or advanced math track ($r = -.08$), being in School 1 versus School 2 ($r = -.01$), or with students' educational expectations ($r = .07$).

Intervention Development, Description, and Implementation

Intervention development. Mindset interventions are more effective when they align with the challenges of the specific educational context (Yeager, Romero, et al., 2016). As such, current intervention was developed through an iterative process of gaining feedback from teachers and students from the two respective schools. Specifically, during the 2015-2016 school year (i.e., the year prior to the intervention), two focus groups were conducted with math and science teachers ($n = 3$ to 4) to discuss the academic and social challenges facing students within and outside of school. During this prior school year, preliminary versions of the presentation and writing exercises were shown to classrooms of students who would be the same age of the students participating the following year (i.e., students who were in seventh grade at School 1 or ninth grade at School 2 during the 2015-2016 school year).

School personnel selected which classrooms of students participated in the pilot test. At School 1, there were 89 seventh-grade student participants who varied in their academic achievement (i.e., both higher-achieving and standard-achieving classes participated), while School 2 chose to issue the pilot test to 53 ninth-grade students who were in lower-performing classes. Students were asked whether the celebrity and scientist stories had included role models who were recognizable and whose stories about overcoming adversity to succeed were relatable. Based on the students' responses to the presentation and exercises, final versions of the intervention for the following year's cohort of students were produced. There was no overlap in the students who participated in the pilot test and the intervention unless they had repeated a grade.

A professional graphic designer animated the delivery of content of intervention to help make the intervention as engaging as possible. In addition, all sections of the intervention were narrated. Narration makes the program more enjoyable for students and ensures that students

with lower reading ability are able to receive the intervention messages. The formatting of the two interventions were identical across the two school districts, but the materials were tailored in minor ways to suit each context.

Intervention description. The persistence mindset intervention contained four key components: growth mindset; struggle stories; social belonging; and two writing reflections. During each dose of the intervention, students viewed a video presentation that integrated all four components together. In the intervention development phase, that the most logical order for presenting these components was to begin with struggle stories, follow with the social belonging content, and end with the growth mindset lesson.

Struggle stories and writing reflections. In this unit, students learned about the academic and social struggles of famous celebrities (i.e., Oprah Winfrey, J. K. Rowling, Walt Disney, Daymond John) and scientists (i.e., Grace Murray Hopper, Neil deGrasse Tyson, Thomas Edison) who were selected based on (a) being well-known by many students and (b) having a compelling story of overcoming adversity. These role models were also selected to represent the racial, gender, and socioeconomic diversity of the student populations. The greater diversity in role models was an improvement from prior struggle-story interventions that included only European-American scientists as role models (Lin-Siegler, Ahn, et al., 2016). The present approach increased the chances that the adolescents would identify with one of the role models' struggles, which is especially important for Black students who have fewer positive role models pursuing academically rigorous careers. While true biographical information was presented for each role model, their struggles matched the challenges noted by students and teachers at the schools. In the final installments of the stories, students learned about the various strategies that the role models used to overcome their challenges.

Belonging mindset testimonials. The bulk of this unit focused on challenges that students from the same school had experienced regarding belongingness during their respective school transition (Walton & Cohen, 2011). After conducting preliminary interviews with students and teachers, the present research team identified common struggles that students had encountered during their transition to seventh grade (in the case of School 1) and ninth grade (in the case of School 2). Students in School 1 noted difficulties related to their peers changing and becoming “followers,” receiving lower academic grades, and sitting through boring and irrelevant classroom instruction. In School 2, students noted similar challenges, but they also expressed difficulty with peer pressure (i.e., changing their behavior to be popular) and the early school starting time, which made it hard for them to concentrate. For the intervention, participants read several student testimonials that were informed by student and teacher input from these preliminary interviews. Importantly, these testimonials later included how that student eventually overcame the challenges with time and effort. Examples of these student testimonials can be found in the Appendix.

Writing exercise 1. Once students learned about the challenges of famous people and their same-aged peers, students had an opportunity to reflect and write about their own challenges (see Appendix for prompt). These brief written responses were intended to help students internalize the intervention messages.

Growth mindset lesson. The growth mindset lesson focused on empirical evidence showing that with effort, students’ success at school can indeed improve (Blackwell et al., 2007; Paunesku et al., 2015). The general message of this lesson was the same as the original intelligence mindset intervention (i.e., that intelligence can be improved with effort), but in this presentation, the message was more condensed and delivered via an engaging video. The lesson

began with the analogy of the brain being like a muscle, in that “exercising” your brain in school will strengthen it and make it work more efficiently. Additionally, given that adolescents become increasingly aware of their cognitive abilities and limitations (Eccles, 1999), the next part of the lesson showed students evidence that the brain and intelligence can still be developed in adolescence (Blackwell et al., 2007). Students then encountered a real-world application of growth mindset principles (i.e., that Apple employers want to hire employees who have positive attitudes toward effort), as adolescents are more likely to engage with instructional material when the content is relevant to their lives (Eccles & Roeser, 2011). Finally, as it is important for students to understand that giving effort is more than just trying harder with the same strategy (Blackwell et al., 2007), students were provided with diverse examples of effort that can increase academic outcomes (e.g., going to after-school tutoring).

Writing exercise 2: Saying-is-believing. In the final section, students wrote a virtual postcard about the intervention content to a student who is a year younger than them (see Appendix for prompt). This exercise utilizes a “saying-is-believing” approach: Because this exercise required students to communicate the intervention’s message to someone other than oneself, it can lead to self-persuasion through cognitive dissonance processes (Aronson, 1999). Notably, the purpose of the writing exercises was to increase student engagement with the activities and the salience of the activities’ messages; therefore, students’ written responses were not included in the analyses.

Intervention implementation. Similar to prior studies (e.g., Walton & Cohen, 2011; Yeager et al., 2016), the present intervention was implemented at the beginning of the school year so as to capitalize on students’ transition between schools. Before students viewed the intervention presentation on a computer, teachers read a script that introduced the presentation as

something that all incoming students view during this school transition. Based on teachers' responses to the student engagement forms, no students asked if the presentation was part of a research study, and teachers' mean rating of each classroom's engagement (i.e., "In general, students were engaged in the task") was 3.69 out of 5, indicating above average engagement.

Control Condition

Our control condition was similar to control conditions used in prior research (e.g., Blackwell et al., 2007; Walton, Logel, Peach, Spencer, & Zanna, 2015). In an effort to mask the presence of different experimental conditions from students, the control presentation was designed to look like the mindset intervention (e.g., it had similar introductory slides and graphics throughout the presentation). The presentation lasted the same amount of time as the mindset intervention and was administered with the same introduction and explanation from teachers.

Our goal with the control condition was to provide a potentially beneficial use of time for students with activities that were devoid of any mindset-related content. Thus, the control condition allowed us to ask not simply whether the mindset intervention on its own was useful, but also whether it was useful above and beyond relatively generic, alternative activities. Students in the control condition completed study skill activities to help control for several potential confounds between conditions, including students' cognitive load, interest, and perceived efficacy from completing the exercises. With respect to its content, the control condition included a discussion of various study strategies associated with positive learning outcomes as well as a lesson on memory. The control presentation also had writing exercises that mirrored those in the experimental condition. The first writing exercise asked students to reflect on a successful study strategy they have used in the past. The second writing activity asked them

to reflect on the presentation materials and recommend specific study strategies to a younger student who might be struggling with school.

Measures

Academic achievement. Students' end-of-year grade point average (GPA) served as an indicator of academic achievement. GPAs were extracted from adolescents' official school records. GPAs operated on a continuous scale ranging from 0.00 to 4.00.

Intervention condition. A dichotomous indicator was used to reflect which intervention condition was assigned to the adolescents, 1 = *mindset intervention*, 0 = *control condition*.

Pre-intervention educational attainment expectations. At the beginning of the school year, students were asked to report their expectations for educational attainment via a standard item question used in national survey studies (e.g., AddHealth): "How far in school do you think you will get?" Responses were on an 8-point Likert scale: 1 = *Less than high-school graduation*; 2 = *Graduate from high school*; 3 = *Post-high-school vocational or technical training*; 4 = *Some college*; 5 = *Graduate from a business or two-year college with an associate's degree*; 6 = *Graduate from a four-year college*; 7 = *Get a master's degree or a teaching credential*; 8 = *Ph.D., law degree, medical degree, or other advanced professional degree*.

Race. Official school records provided data on the adolescents' racial/ethnic group. Adolescents who were categorized as White or Black were included in the analysis. Race was coded as 1 = *Black* and 0 = *White*.

Covariates. Prior year GPA and students' gender (1 = *male*; 0 = *female*) were included as covariates, all of which were obtained from students' official school records. To account for potential peer context and course rigor effects, controls were included for adolescents' math course track (i.e., *low*, *standard*, or *high* track, with *high* as the reference group) and the analysis

accounted for student clustering in these classes to produce robust standard errors. Finally, the analyses controlled for whether students were in School 1 or School 2 (1 = *School 1*; 0 = *School 2*).

Analytic Plan

Prior to the central analysis, a randomization check was conducted across the two schools. Students assigned to the intervention were compared to students assigned to the control condition on the following pre-intervention or demographic characteristics: pre-intervention educational expectations, prior year GPA, gender, race, and math course track.

Given the small sample of White youth in School 1 ($n = 53$) and of Black youth in School 2 ($n = 7$), School 1 and School 2 were combined together for analyses (and then included a control variable for school site). However, as noted below in the results, analyses that separated School 1 and 2 followed the same pattern as the overall sample. The main analyses were based on a linear regression model predicting adolescents' GPA in *Mplus* (version 8; Muthén & Muthén, 2017). Specifically, GPA was regressed on intervention condition, race, educational expectations, and all interaction terms among these three variables. GPA was also regressed on the covariates. Full information maximum likelihood (FIML) was used to address missing data, which unlike listwise deletion, allows for the use of all available data (Baraldi & Enders, 2010). Missing data ranged from 0% to 25% on any given variable. Importantly, 95% of students had data indicating their end-of-year GPA.

Results

As shown in Table 1, randomization was successful. Students in the two conditions were not statistically different on any of the assessed characteristics within each school. Descriptive statistics indicated that all continuous variables were normally distributed (see Table 2).

Bivariate correlations suggested that the mindset intervention was not associated with end-of-year GPA, potentially indicating that the intervention may work differently for subgroups of students.

Table 3 presents the linear regression model predicting GPA in the overall model that combined the two school samples. The intervention condition had no main effects; instead, results indicated a significant three-way interaction between intervention condition, students' race, and pre-intervention educational expectations. To probe this interaction, these interactive effects were graphed and are presented in Figure 1a. Analyses examined the intervention effect for White and Black students with relatively lower ($-1 SD$) and relatively higher ($+1 SD$) educational expectations. Simple slope analyses using the *Mplus* command, MODEL CONSTRAINT, showed a significant effect of the intervention condition among Black adolescents with relatively higher educational expectations at baseline. Specifically, the mindset intervention predicted significantly higher GPAs than the control condition among this subgroup of students (simple slope $\beta = .495, p < .001$). Interestingly, there appeared to be the opposite effect among White youth with higher educational expectations, who seemed to benefit more from the control condition than from the mindset intervention (simple slope $\beta = -.115, p < .05$). Consistent across both Black and White groups, students with lower educational expectations achieved the same GPAs regardless of condition (simple slope $\beta = .021, p = .572$ for White students, $\beta = -.118, p = .474$ for Black students). Notably, as indicated by the significant interactions in Table 3 and Figures 1b and 1c, these patterns held for Black and White adolescents in School 1, as well as for White adolescents in the majority-White School 2.

Post-hoc analysis. The current intervention was a holistic approach to changing the way students think about and ultimately engage in challenges within the school setting. Post-hoc

analyses examined whether changes in students deeper-level, cognitive engagement and persistence in school may explain the present results using the survey assessment data, which included the School Cognitive Engagement measure at each wave of data collection (Wang, Fredricks, Ye, Hofkens, & Linn, 2017). Students were asked three items about positive approaches to challenge (“I look over my schoolwork and make sure it’s done well”; “I keep trying when I get stuck on my schoolwork”; “I figure out what I did wrong when I make mistakes on my homework”) and maladaptive responses to challenge (“I give up right away when I don’t understand” [reverse-coded]; “Finishing my homework fast is more important to me than doing it well” [reverse-coded]; “When school work is too hard, I just don’t do it” [reverse-coded]). At each wave, students responded on a 5-point Likert scale ranging from 1 = *not at all like me* to 5 = *very much like me*. The six items were averaged together to create cognitive engagement composite scores at the pre-intervention assessment ($\alpha = .86$, $M = 3.95$, $SD = .73$), first post-intervention assessment ($\alpha = .82$, $M = 3.74$, $SD = .71$), and second post-intervention assessment ($\alpha = .84$, $M = 3.66$, $SD = .73$).

Interestingly, as shown in Table 4, analyses found that the interaction among intervention condition, race, and pre-intervention educational expectations predicted the first post-intervention assessment of cognitive engagement (i.e., one month later), but not the second post-intervention assessment (i.e., five months later). As shown in Figure 2, the pattern of results on cognitive engagement at the one-month follow-up was very similar to the patterns on educational achievement. The intervention appeared to benefit Black students with high educational expectations (simple slope $\beta = .228$, $p < .05$), whereas the study skills control was significantly better for White students with high educational expectations (simple slope $\beta = -.128$, $p < .05$). In line with the GPA findings, no effects were observed for adolescents with low educational

expectations (simple slope β for Black students = $-.131$, $p = .264$; simple slope β for White students = $.013$, $p = .874$).

To understand the relationship between the two dependent variables, analyses found that cognitive engagement at one month was a positive predictor of GPA, even after controlling for pre-intervention cognitive engagement and all other control variables in the model ($\beta = .138$, $p < .05$). Finally, models were examined that predicted cognitive engagement and GPA simultaneously with a path model that treated cognitive engagement as a mediator of the three-way interaction effect on GPA (in addition to all aforementioned controls). The analysis revealed a significant indirect effect ($\beta = .023$, $p < .05$)—that is, the joint (indirect) effect of the three-way term on cognitive engagement (a path) and of cognitive engagement on GPA (b path) was significant (with the indirect effect calculated as $a*b$). Although the path model does not afford strong causal inferences about the effect of cognitive engagement on performance, this result suggests it is plausible that the intervention operated on performance, in part, by changing students' cognitive engagement.

Discussion

Mindset interventions have been proposed as a means by which to promote student engagement and achievement in school settings; however, very few of these interventions have integrated multiple mindset intervention approaches or tested theories about the boundary conditions for mindset effects. This study sought to conceptually integrate three mindset interventions to highlight their shared psychological syntax, thereby potentially increasing their effectiveness. In two randomized controlled trials, the efficacy of a persistence mindset intervention was tested. Results revealed that the intervention was effective for a particular subset of students, namely Black students with high educational expectations. For this subset of

students, participation in the intervention resulted in better grades over the course of the year and, as demonstrated in post-hoc analyses, higher cognitive engagement. For all White students (regardless of educational expectations) and for Black students with low educational expectations, the intervention did not result in higher grades. In fact, White students with high educational expectations tended to benefit from the control activities more than they benefited from the intervention. Together, these findings have several connections to previous work as well as implications for theoretical and practical implications.

Consistent with the results of a recent meta-analysis of mindset interventions (Sisk et al., 2018), there was no evidence of a main effect between the treatment and control conditions. Despite efforts to create a more comprehensive and integrated intervention that would capitalize on a broader bandwidth of presentation modalities and content, the results did not show a general benefit for all students. Instead, benefits of the intervention were conditional, with only Black students who had high educational expectations reaping any benefits on academic achievement and cognitive engagement. In this regard, the findings are consistent with the idea that mindset interventions are not a magic bullet (Yeager & Walton, 2011), and they alone are not always enough to boost the educational outcomes of students in general and at-risk students in particular. Among Black students who did not see educational attainment as likely or probable for them personally, the intervention did not have an effect. In other words, students may not only need assurances that they can succeed with persistence and effort, they may also need high educational expectations for themselves to perform well. Providing students with assurances who did not hold high expectations for future education may have rendered these assurances meaningless or inconsequential.

Effects among Black Students

Although the intervention benefits were somewhat limited in scope, the examination of the intersection between the intervention, race, and educational expectations provides useful theoretical and practical insights. First, stereotype threat researchers have indicated that while Black students in general contend with negative stereotypes, some Black students are more susceptible than others to the negative effects of these stereotypes (Schmader, Johns, & Forbes, 2008). In general, it is not the indifferent or apathetic students, but rather the students who feel like their identity is “on the line” in the academic domain who are most at risk for experiencing stereotype threat effects (see Steele, 1997). For students from negatively stereotyped backgrounds with high educational expectations, doing well in school may have long-term, self-relevant implications, and the vulnerability to negative academic feedback this creates may heighten the psychological stakes for success and failure (see Spencer, Logel, & Davies, 2016 for a review). In one study, Osborne and Walker (2006) found that racial minority adolescents who reported that school was highly important to their lives were, ironically, most likely to eventually withdraw from school.

Furthermore, the present results are consistent with the idea that high educational expectations heightened the stakes for Black students. That is, high educational expectations among Black students appeared to be decidedly unhelpful in the control group. Black students with high expectations in the control group actually performed *worse* than Black students with lower expectations. This difference was mitigated, however, among Black students who received the intervention. For Black students with high educational expectations, the intervention may have been received as it was designed to be received: a timely and reassuring exercise during a period of transitional unease. Unlike students in the control group, students receiving the intervention were directly informed that intelligence is not a fixed trait, that this intelligence is

growable with effort, and that doubts about belonging are normal and likely to dissipate with time. Moreover, those in the intervention were exposed to concrete examples of other high-profile, high-aspiring people who stumbled, often repeatedly, on their way to success. Students received this content at a critical juncture in their educational career: the transition to secondary school. For Black students with high educational expectations, the intervention messages, administered by a teacher during classroom instruction, may have been both self-relevant and reassuring.

In contrast, Black students with low educational expectations may have had a different experience with the intervention materials. Students with low educational expectations may have been less impacted by negative stereotypes if the academic domain was less self-relevant (Spencer et al., 2016). For instance, with a low expectation for school success, perhaps students did not envision themselves as entrepreneurs or intellectuals, making the struggle-stories of the exemplars less applicable to their lives or assumed futures. One possibility to be explored in future research is whether low expectations were in fact associated with disidentification and disengagement from the academic domain (see Nussbaum & Steele, 2007; Wang & Holcombe, 2010). Students who feel disengaged from the academic domain may be more difficult to reach with a classroom based, academics-focused intervention. The present results support the idea that examining race and educational expectations in tandem may help to advance understanding of intervention effects by acknowledging the important heterogeneity that can exist within racial and ethnic populations and help direct the refinement and effectiveness of interventions (see Amemiya & Wang, 2018; Wang & Degol, 2014).

Effects among White Students

Different factors seem likely to have been at work for White students. Indeed, if one assumes that the control condition was relatively inert (as it was intended to be), results suggest that the mindset intervention was actually deleterious to the performance of White students with high educational expectations. That is, a trend was observed in School 1 and a significant effect in School 2 whereby White students with high educational expectations performed worse in the mindset condition than in the control condition. Although not anticipated, some precedent for this effect can be found in the literature. In Walton and Cohen (2007; Experiment 2), for example, White college students who received a belonging mindset intervention performed worse than expected, while White students in the control condition performed better than expected based on prior performance. Although there was a similar pattern among White students with high educational expectations, the present studies were conducted in secondary schools, where the educational expectations are likely lower and more variable than those found in college. With this caveat in mind, a similar application of developmental theory may explain both sets of findings.

White students generally do not contend with negative intellectual stereotypes about their race. In fact, they sometimes benefit from the salience of racial stereotypes in academic settings, a phenomenon known as *stereotype lift* (Walton & Cohen, 2003). Positive academic stereotypes attached to White students' intellectual ability should logically lessen doubts about belonging in academia. With respect to the present findings, positive racial stereotypes may give comfort to high-aspiring White students for many of same reasons that negative racial stereotypes are threatening to high-aspiring Black students.

Whereas negative stereotypes can amplify ambiguity about whether Black students are capable of success, positive stereotypes may help clarify for White students that they are capable

of academic success. If so, then demystifying the nature of success through exposing these students to famous struggle stories, growth mindsets, and belongingness may temper the effects of positive stereotypes on White students' outcomes. In other words, it may be that the integrated intervention unintentionally heightened vulnerabilities for White students by making success seem less ordained and certain. In this case, the intervention may have inadvertently planted doubts for these students about the inevitability of their own success. More research is clearly needed to understand and avoid possibly adverse effects of interventions for any student groups.

Limitations and Future Research

This study has several limitations. First, although the present sample was socioeconomically and racially diverse, the study was only conducted in two schools, which may limit the generalizability of its findings. Future studies should attempt to replicate this study's results with different samples in different schools. Relatedly, the study focused on individual student factors, but there are school and classroom factors that may influence the intervention effect as well. It would be informative to examine whether and how teacher, peer, and school characteristics moderate the effect of mindset interventions on students' academic performance to improve understanding of what types of educational contexts are most conducive and to the effects of mindset interventions.

Future research should also continue to explore the different mechanisms through which persistence interventions can transform student mindset beliefs and stimulate academic achievement. The present research sought to conceptually integrate content from three related interventions. Analyses of a measure of cognitive engagement at the one-month follow-up suggested that the intervention as a whole operated psychologically, in part, by affecting students' cognitive engagement, which in turn predicted their GPA. One limitation associated

with this study's approach is a lack of precision about which element(s) were the most important or if some elements work better together than others. Future studies should aim to disentangle which intervention approaches are most effective for which types of students in which types of circumstances.

Some students (e.g., White students with high expectations) showed relative benefits for control exercises compared to treatment effects. This suggests that simply delivering mindset interventions to all students may be suboptimal for enhancing school-wide outcomes. Relatedly, while race was examined as an individual difference factor, there was important heterogeneity within racial groups (García Coll et al., 1996). Examining moderating factors such as racial identity is an important direction for future intervention research. Overall, continued research is needed to understand who can benefit from mindset interventions and what interventions may be most effective at reaching diverse student bodies.

Finally, although the intervention effect sizes in the present research were small in an absolute sense, their magnitude is consistent with those found in mindset intervention studies that have focused on academic outcomes (Blackwell et al., 2007; Schmidt, Shumow, & Kackar-Cam, 2017; Yeager, Walton, et al., 2016). Students' academic outcomes are often driven by recursive processes, where earlier success begets future success, which in turn begets even further future success, and so on. In such a system, even small changes in a student's perceptions can potentially lead to a large impact on their academic trajectories over time (Cohen & Sherman, 2014).

Conclusion

This study represents an integration and evolution of previous mindset intervention strategies that help students from at-risk backgrounds cope with the academic and social

stressors due to the transition to middle or high school. Recognizing that several mindset interventions had similar underlying messages (e.g., normalizing and reappraising challenges), this study used these messages to reinforce and strengthen one another in a way that research suggests students would find engaging and memorable. In addition, this study identified specific mechanisms that are effective at increasing students' persistence and performance in school by addressing the conditions under which the intervention can promote academic success. In particular, the messages of persistence interventions—which tell students that if they put appropriate effort and the time into their studies, they will improve their academic performance—appear more effective among racial minority students who already envision themselves persisting in school. That is, racial minority students are more likely to attend to and use the interventions' education-specific lessons if they personally foresee education in their future. The present study is also one of the first attempts to integrate and extend previous work on mindsets to a highly sensitive time for shaping long-term student academic trajectories: the transition to middle or high school. In this way, the present study uses past work as the building blocks for developing an integrated, low-cost, easy-to-implement intervention protocol for promoting at-risk students' academic performance.

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Table 1

Effectiveness of Random Assignment for School 1 and School 2

Variable	Mindset Intervention		Control Condition		Test Statistics
	<i>M</i> or %	<i>SD</i>	<i>M</i> or %	<i>SD</i>	
School 1					
Educational Expectations	6.01	2.11	5.72	1.87	$t(146) = 0.896, p = .372$
Prior Year GPA	2.67	0.92	2.63	0.90	$t(164) = 0.813, p = .763$
Male (vs. Female)	50.0%	--	50.0%	--	$\chi^2(1) = 0.000, p = 1.000$
Black (vs. White)	52.4%	--	47.6%	--	$\chi^2(1) = 1.262, p = .261$
Low (vs. High) Course Track	54.8%	--	45.2%	--	$\chi^2(1) = 0.421, p = .517$
Standard (vs. High) Course Track	50.0%	--	50.0%	--	$\chi^2(1) = 0.077, p = .782$
School 2					
Educational Expectations	6.14	1.59	6.21	1.55	$t(350) = -0.411, p = .681$
Prior Year GPA	3.40	0.31	3.41	0.26	$t(346.50) = -0.475, p = .635$
Male (vs. Female)	53.0%	--	47.0%	--	$\chi^2(1) = 0.565, p = .452$
Low (vs. High) Course Track	54.5%	--	45.5%	--	$\chi^2(1) = 0.236, p = .627$
Standard (vs. High) Course Track	49.8%	--	50.2%	--	$\chi^2(1) = 0.001, p = .980$

Table 2

Means, Standard Deviations, Skewness, Kurtosis, and Correlations Among School 1 and School 2 Variables

Variables	1	2	3	4	5	6	7	8
School 1								
1. GPA	—							
2. Mindset Intervention (vs. Control)	-.01 _a	—						
3. Pre-Intervention Educational Expectations	.23	-.07 _a	—					
4. Prior Year GPA	.65	.02 _a	.29	—				
5. Black (vs. White)	-.47	.08 _a	-.12 _a	-.23	—			
6. Male (vs. Female)	-.15	.00 _a	-.19	-.04 _a	-.00 _a	—		
7. Low (vs. High) Course Track	-.39	.07 _a	-.34	-.64	.27	.17 _a	—	
8. Standard (vs. High) Course Track	-.50	.02 _a	-.23	-.68	.27	.07 _a	—	—
<i>M</i> or %	2.30	50%	5.86	2.65	73%	50%	16% ^b	49% ^b
<i>SD</i>	.93	—	1.99	.91	—	—	—	—
Skewness	-.06	—	-.85	-.30	—	—	—	—
Kurtosis	-.51	—	-.06	-.45	—	—	—	—
School 2								
1. GPA	—							
2. Mindset Intervention (vs. Control)	-.08 _a	—						
3. Pre-Intervention Educational Expectations	.38	-.02 _a	—					
4. Prior Year GPA	.76	-.03 _a	.42	—				
5. Male (vs. Female)	-.11	.04 _a	-.21	-.21	—			
6. Low (vs. High) Course Track	-.69	.04 _a	-.37	-.82	-.07 _a	—		
7. Standard (vs. High) Course Track	-.26	-.00 _a	-.00 _a	-.31	-.07 _a	—	—	—
<i>M</i> or %	3.41	51%	6.18	3.41	52%	29% ^b	60% ^b	—
<i>SD</i>	.33	—	1.57	.28	—	—	—	—
Skewness	-.52	—	-.93	-.42	—	—	—	—
Kurtosis	.08	—	.62	-.51	—	—	—	—

Note. All coefficients are significant ($p < .05$), except those with subscript _a. ^bThe denominator was the full sample.

Table 3

Linear Regression Models Predicting End of the Year GPA

	Overall:		
	School 1 + 2	School 1	School 2
	<i>B (SE)</i>	<i>B (SE)</i>	<i>B (SE)</i>
Intercept	3.38 (.09)***	3.00 (.16)***	3.48 (.04)***
Prior Year GPA	0.62 (.11)***	0.56 (.12)***	0.77 (.07)***
Male (vs. Female)	-0.11 (.08)	-0.19 (.09)*	0.03 (.02)
Low (vs. High) Course Track	0.05 (.06)	0.03 (.16)	-0.12 (.05)*
Standard (vs. High) Course Track	-0.08 (.11)	-0.08 (.11)	-0.05 (.04)
Mindset Intervention (vs. Control)	-0.05 (.03)	-0.18 (.20)	-0.04 (.03)
Pre-Intervention Educational Expectations	0.04 (.02)	0.08 (.09)	0.03 (.01)**
Black (vs. White)	-0.72 (.09)***	-0.83 (.12)***	—
School 1 (vs. School 2)	-0.28 (.08)***	—	—
Intervention X Black	0.25 (.09)**	0.33 (.16)*	—
Intervention X Expectations	-0.04 (.02)*	-0.08 (.10)	-0.03 (.01)*
Black X Expectations	-0.18 (.04)***	-0.20 (.09)*	—
Intervention X Black X Expectations	0.24 (.09)**	0.24 (.09)**	—

Note. All coefficients are unstandardized beta's. Continuous variables have been mean-centered.
 * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4

Linear Regression Models Predicting Post-Intervention Cognitive Engagement within the

Overall Sample of Schools 1 and 2

	Cognitive Engagement 1 Month Later <i>B (SE)</i>	Cognitive Engagement 5 Months Later <i>B (SE)</i>
Intercept	3.52 (.08)***	3.64 (.10)***
Prior Year GPA	0.19 (.05)***	0.13 (.08)
Male (vs. Female)	0.06 (.04)	-0.02 (.06)
Low (vs. High) Course Track	0.11 (.09)	0.07 (.09)
Standard (vs. High) Course Track	0.17 (.08)*	0.00 (.09)
Mindset Intervention (vs. Control)	-0.06 (.06)	-0.04 (.06)
Pre-Intervention Educational Expectations	0.05 (.03)*	0.01 (.04)
Black (vs. White)	-0.24 (.10)*	0.10 (.14)
School 1 (vs. School 2)	0.35 (.10)***	0.06 (.09)
Cognitive Engagement (pre-intervention)	0.64 (0.03)***	0.59 (0.04)***
Intervention X Black	0.11 (.11)	-0.02 (.13)
Intervention X Expectations	-0.04 (.03)	0.02 (.04)
Black X Expectations	-0.15 (.04)***	-0.03 (.06)
Intervention X Black X Expectations	0.15 (.04)***	-0.10 (.10)

Note. All coefficients are unstandardized beta's. Continuous variables have been mean-centered.

* $p < .05$. ** $p < .01$. *** $p < .001$.

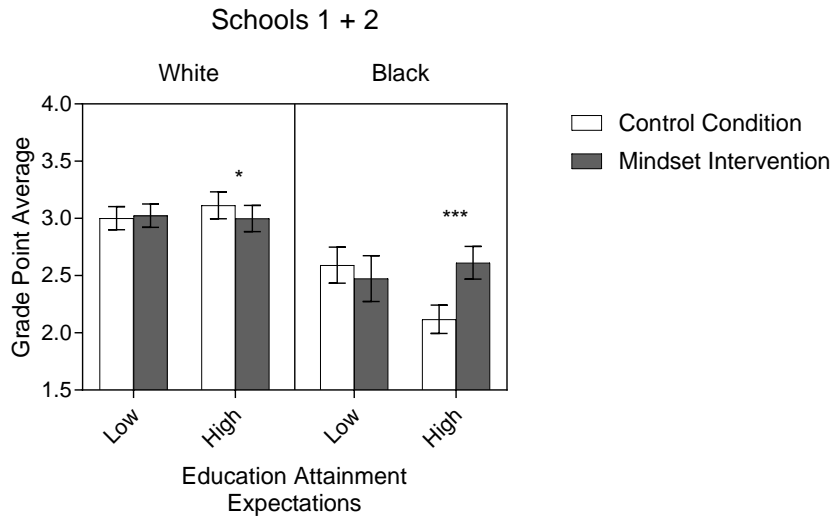
Table 5

*Linear Regression Models Predicting End of the Year GPA with One-Month Post-Intervention**Cognitive Engagement*

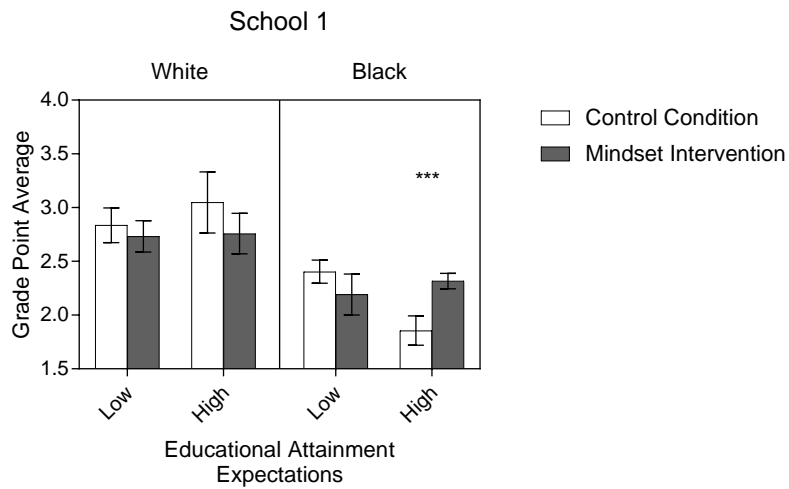
	Overall: School 1 + 2 β (SE)
Intercept	3.52 (.08)***
Prior Year GPA	0.58 (.10)***
Male (vs. Female)	-0.06 (.04)
Low (vs. High) Course Track	-0.11 (.07)
Standard (vs. High) Course Track	-0.07 (.06)
Mindset Intervention (vs. Control)	-0.04 (.03)
Pre-Intervention Educational Expectations	0.03 (.02)
Black (vs. White)	-0.68 (.09)***
Intervention X Black	0.22 (.09)*
Intervention X Expectations	-0.04 (.02)
Black X Expectations	-0.15 (.04)***
Intervention X Black X Expectations	0.20 (.04)***
School 1 (vs. School 2)	-0.33 (.08)***
Cognitive Engagement (pre-intervention)	-0.00 (0.04)
Cognitive Engagement (1-month post-intervention)	0.12 (0.03)***

Note. All coefficients are unstandardized beta's. Continuous variables have been mean-centered.

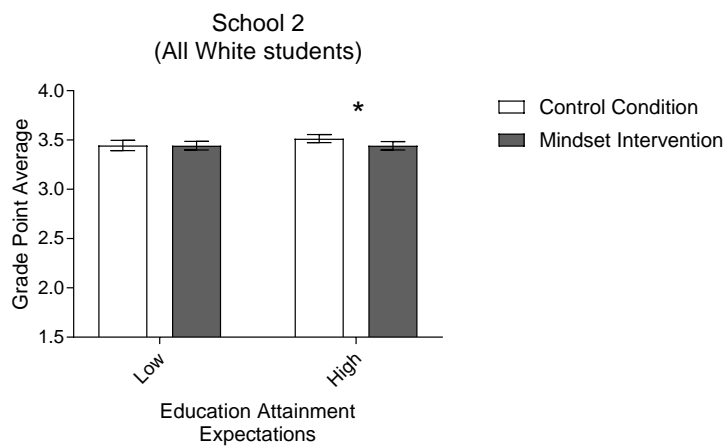
* $p < .05$. ** $p < .01$. *** $p < .001$.



(a)



(b)



(c)

Figure 1. (a) Three-way interaction between intervention condition, race, and educational attainment expectations across Schools 1 and 2 predicting end-of-year GPA. (b) Three-way interaction between intervention condition, race, and educational attainment expectations at School 1. (c) Two-way interaction between intervention condition and educational attainment expectations among White adolescents at School 2.

Note. Bars in the figure are standard error bars of the estimated means.

* $p < .05$. *** $p < .001$.

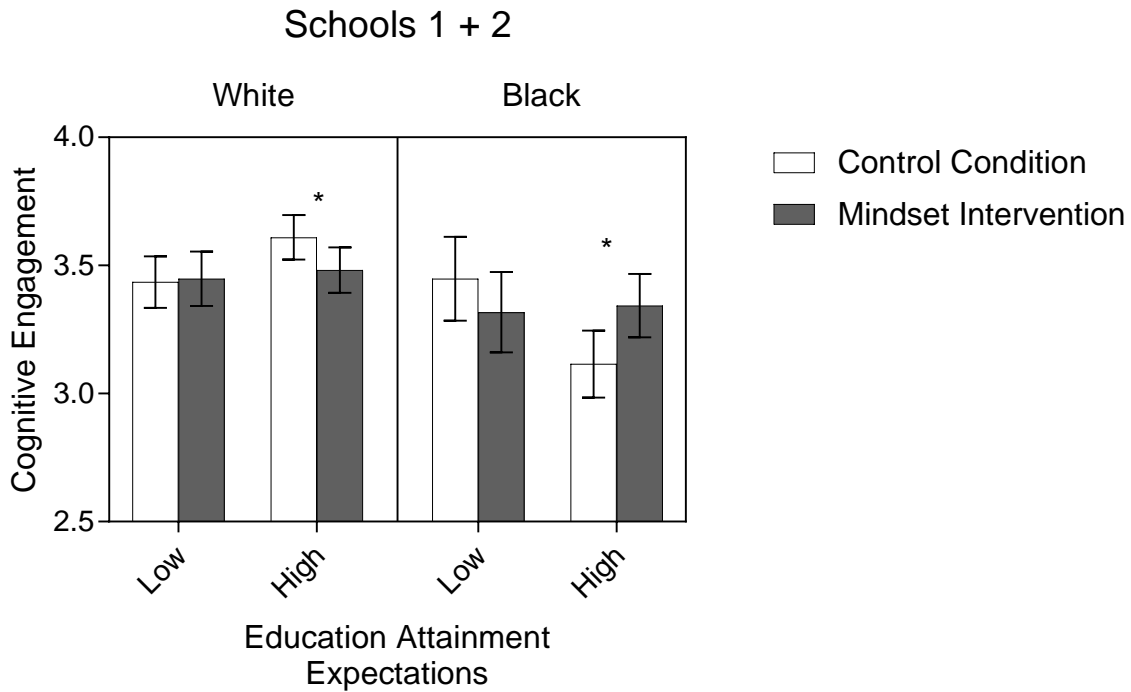


Figure 2. Three-way interaction between intervention condition, race, and educational attainment expectations predicting cognitive engagement one-month post-intervention across both schools.

Note. Bars in the figure are standard error bars of the estimated means.

* $p < .05$. *** $p < .001$.

Appendix

Examples of Student Testimonials in the Social Belonging Component of the Intervention

School District 1 and 2: “Sometimes it feels like what we’re learning doesn’t really matter. I’m like, ‘How does this even relate to me?’ ... I was really bored in class at first. But then I told myself, ‘I need to be here all day every day. I might as well try to get something out of it.’ Now I find ways to be interested in what I’m doing in class. Like, I think about how it relates to my life and my goals.”

School District 2: “When I got to 9th grade, everything felt different. All of my friends were changing and trying to be popular. Honestly, I thought I had to be just like them... I had a

hard time finding my real friends. But I realized a lot of people do too. I wish I could tell my 9th grade self, ‘Don’t worry about fitting in! It takes time. Soon you’ll find your group of friends.’”

Writing Exercise 1 Prompt: Struggle Reflection

Write about one challenge that you might be worried about in (7th or 9th) grade. Then, write one way you can work through this challenge.

Writing Exercise 2 Prompt: Saying-Is-Believing

We want to pass on today’s message to (6th or 8th) graders, but we need your help. We’d like you to write a postcard to a (6th or 8th) grader who is nervous about starting (7th grade or high school). Please tell this student about what they can do to overcome a challenge that they might face in (7th or 9th) grade.