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The Impacts of a Brief Middle-School Self-Affirmation Intervention Help Propel African American and Latino Students Through High School

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Stereotype threat has been shown to have deleterious impacts on the short- and long-term academic performance and psychological well-being of racial and ethnic minority students. Psychological variables related to this identity threat represent significant sources of achievement and attainment gaps relative to nonstereotyped Asian and white students who do not tend to be subject to performance declines related to such threats. In the current study, we investigate long-term effects of a brief self-affirmation intervention implemented at-scale to mitigate stereotype threat for seventh-grade African American and Latino students. Relative to their control-group counterparts, our findings indicate that a self-affirming intervention to buffer racial and ethnic minority students from identity threats reduced the growing achievement gap by 50% per year between seventh and 12th grade (N = 802). As a result, the achievement gap between white/Asian and African American/Latino students decreased by 42% at the end of 12th grade. Finally, the intervention increased on-time graduation rates for treated minority students by 10 percentage points (N = 952). Implications for theory, policy, and future research are discussed.

Educational Impact and Implications Statement

Students of color routinely confront bias and negative stereotypes about their ability to succeed academically in secondary schools. Such "threats in the air" have been shown to cause a variety of negative responses among African American and Latino students, including decreased psychological well-being, anxiety, and decreased working memory, all of which can negatively impact the students' academic outcomes. In fact, these "threat responses" may account for as much as one third of the achievement gaps separating African American and Latino students from their white counterparts. With a brief, but precisely timed, series of four written exercises, seventh graders were offered the opportunity to reflect on other valued aspects of their personal identities beyond school. These so-called "self-affirmations" can help deflect some of the harm of bias and discrimination and help students of color to perform to their true potentials. Throughout an entire school district, we administered these exercises to seventh-grade students and tracked their academic progress through 12th grade. Our results suggest that the self-affirmations cut the growing achievement gaps in half and increased on-time graduation rates for students of color by 10 percentage points. Our article discusses how and under what circumstances such a brief intervention can have such strong and enduring effects.

Keywords: secondary schools, intervention, racial/ethnic minority students

The transition to secondary school can be a particularly challenging period for students—academically, socially, and psychologically. Stage-environment fit theorists, including Eccles, Lord, and Midgley (1991), argue that secondary schools typically fail to meet the psychological needs of their students, and this needs-resource mismatch results in declines in perceived emotional support from teachers, a decreased sense of belonging in the classroom, and waning academic engagement. During this critical developmental stage, which is characterized by adolescents' sensitivity to social acceptance, a cycle of internalized academic and social doubt can deeply threaten students' social well-being, academic engagement, and long-term academic achievement.

This can be a particularly sensitive period for minority students, who are simultaneously navigating a critical phase of ethnic identity formation (French, Seidman, Allen, & Aber, 2006) while encountering school environments that all too often undermine their social and psychological well-being and that both directly and indirectly call into question their abilities to succeed academically. Evidence from a number of studies reveals steeper declines in

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secondary-school academic performance among African American and Latino students relative to their Asian and white peers and that these struggles tend to be driven by social-psychological factors (Anderman, 2003; Cook, Purdie-Vaughns, Garcia, & Cohen, 2012; Sherman et al., 2013; Shim, Ryan, & Anderson, 2008; Yeager, Purdie-Vaughns, Hooper, & Cohen, 2017).

Further investigation is necessary to identify sustainable methods that may mitigate these long-term and compounding declines in academic performance and social-psychological well-being for racial/ethnic minority students. In addition, the scope of these disparities warrants scalable interventions that balance the efficiency necessary to implement high-fidelity solutions while effectively interrupting the pervasive mechanisms producing social and psychological identity threats within secondary schools across the country. One such intervention, which we assess in the current article, is the process of *self-affirmation* in order to buffer racial/ethnic minority secondary students from perceived social identity threats within the academic domain. Specifically, by affirming other valued aspects of one's identity—such as friends and family, religion, or creativity—that are outside of the threatened domain, self-affirmation interventions may help protect students from the social-psychological harm caused by the biases and negative stereotypes that they routinely confront in secondary schools.

Our results suggest that potentially threatened African American and Latino students who received the self-affirmation intervention realized higher grade point averages through high school and improved on-time graduation rates relative to their control-group counterparts. Specifically, the treatment reduced the growing achievement gap between white/Asian and African American/Latino students by 50% per year between seventh and 12th grade and, as a result, decreased the gap by 42% at the end of 12th grade. In addition, the seventh-grade intervention's sustained benefits increased on-time graduation rates for treated racial/ethnic minority students by 10 percentage points.

Sources of Social Psychological Threats in Secondary School

Recent work by Bohrnstedt, Kitmitto, Ogut, Sherman, and Chan (2015) suggests that approximately half of the Black-White achievement gap can be explained by *within*-school sources of inequality. Structural differences, including various forms of academic tracking, which effectively resegregate minority students within lower-level courses (Mickelson, 2001; Oakes, 1995), and application of disproportionate (Losen, 2011), and unusually harsh discipline from authority figures (Fisher, Wallace, & Fenton, 2000) often marginalize minority students and signal limited authority support within schools. Within classrooms, differences in teachers' perceptions of their students' academic potentials can produce so-called "Pygmalion Effects" or "Golem Effects," whereby, respectively, teachers' higher or lower expectations result in self-fulfilling prophecies of students' academic performance, regardless of the accuracy of those beliefs (Rosenthal & Jacobson, 1968). Because white teachers tend to underestimate the abilities of minority students (Dee, 2005; Gershenson, Holt, & Papageorge, 2016), these biases may, in turn, affect minority students' academic expectations for successfully completing secondary and postsecondary school (Cherng, 2017).

Beyond these structural and expectation-based biases that may undermine minority students' academic performance, negative stereotypes or attitudes toward specific groups, which are not necessarily manifested by conscious thoughts or actions, also may negatively impact the academic trajectories of students of color (Devine, 1989). One prominent example is the idea of stereotype threat (Steele & Aronson, 1995). This phenomenon may contribute to the structural and expectation-based biases discussed above, but also may impact directly minority students for whom the negative societal stereotype is salient. This social identity threat can negatively affect minority students' performance in the stereotyped domain, even for those who do not personally endorse the stereotype and who vary in their degree of group identification (Steele & Aronson, 1995; Steele, Spencer, & Aronson, 2002). Regarding the process of how stereotype threat impacts individuals, Steele and Aronson (1995) noted in their seminal work that stereotype threat impacts students mainly by raising concerns that one's performance on certain tasks may confirm a negative stereotype that exists about an identity or group to which an individual belongs.

The authors discussed this process specifically in terms of African American students' performance on academic tasks, but it has similar implications for a variety of groups. For instance, stereotype threat has been shown to impact females' mathematics performance (Spencer, Steele, & Quinn, 1999), and the negative implications for the academic outcomes of Latino students are essentially equivalent to those for African American students (Nadler & Clark, 2011). Although the nature of the threat responses is diverse, the consistent consequence of these responses is that students have fewer psychological and cognitive resources to devote to academic tasks, which in turn causes poorer performance. Specifically, the experience of stereotype threat, and other identity threats, leads to poorer academic performance through various psychological, physiological, and behavioral responses, including stress, anxiety, decreased working memory, and increased vigilance to identity threat cues (Schmader & Beilock, 2012; Schmader, Johns, & Forbes, 2008).

A meta-analysis of this research by Walton and Spencer (2009) suggests that the phenomenon of stereotype threat degrades African American and Latino students' performances on standardized tests of ability by approximately one fifth of a standard deviation. With nationally representative data from the National Assessment of Educational Progress (NAEP) test indicating that the mathematics and reading achievement gaps separating African American and Latino students from their higher scoring white peers tend to be between about 0.6 to 0.75 standard deviation units (Musu-Gillette et al., 2017), stereotype threat may account for approximately one-quarter to one third of these national gaps.

An accumulation of short-term underperformances on academic tasks caused by stereotype threat may, over time, lead students to alter their career and/or professional aspirations and their sense of belonging in academic domains and contexts (Steele, James, & Barnett, 2002). These threat responses, which can cause students to "protectively disidentify" from academics (Aronson, Fried, & Good, 2002; Major, Spencer, Schmader, Wolfe, & Crocker, 1998; Steele, 1997), can contribute to a form of "double jeopardy," which interferes with both short-term performance and long-term knowledge acquisition and academic attainment, thus contributing to a "downward spiral" of school performance (Cohen & Garcia, 2008; Taylor & Walton, 2011). Indeed, recent research suggests

that stereotype threat can impede the learning process itself (Taylor & Walton, 2011). Thus, research on stereotype threat suggests that the phenomenon cannot only impact threatened minority students' performances in school on important proximal outcomes, such as tests or class assignments, but may also affect long-term academic outcomes, including school engagement and, potentially, secondary and postsecondary attainment.

Intervening on Stereotype Threat

Though national data on achievement gaps paint a depressing picture, recent studies have provided evidence that interventions targeting social-psychological variables and conditions related to African American and Latino students' academic underperformance can have statistically and practically significant positive impacts on both proximal and distal academic performance and attainment outcomes.

Evidence from a growing number of studies suggests that brief classroom-based writing exercises focusing on buffering African American and Latino students against stereotype threat can positively impact academic performance, in both the short-term (e.g., Borman, Grigg, & Hanselman, 2016; Bowen, Wegmann, & Webber, 2013; Cohen, Garcia, Apfel, & Master, 2006; Sherman et al., 2013) and over a number of years (Borman, Grigg, Rozek, Hanselman, & Dewey, 2018; Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009; Goyer et al., 2017). These studies leverage the process of self-affirmation (Steele & Liu, 1983; Liu & Steele, 1986), wherein affirming beliefs and values about oneself, one's group, community, practices, and culture can buffer against threats to one's identity, such as stereotypes. Through brief 15–20 min writing exercises, these self-administered student self-affirmation interventions prompt individuals to write about their core beliefs and values. Cohen et al. (2006) reported that such a self-affirmation intervention reduced the African American-white GPA gap among seventh-grade students by 40%. Sherman et al. (2013) reported similar impacts on Latino American middle-school students' GPAs. More recent longitudinal studies have revealed enduring impacts beyond middle school on outcomes including high school GPA (Borman et al., 2018), more advanced high school course-taking behavior by Latino students, and an increased probability of attending college for African American students (Goyer et al., 2017).

Though these latter sustained impacts beyond middle school are powerful findings, a major limitation of these studies is the scale at which they were implemented. Scalability of these findings is critical to considering generalizability and potential policy implications of widespread efforts to reduce racial and ethnic achievement gaps. Borman et al. (2016) previously reported on the findings of short-term effects of a self-affirmation intervention targeting seventh-grade students across an entire school district. Results suggested that the intervention had statistically significant impacts on racially and ethnically diverse students' seventh-grade GPA and, though less robust, some impacts on standardized achievement scores. A longitudinal follow-up revealed sustained impacts on GPA through ninth grade, with results indicating that self-affirmation reduced the growth of the racial achievement gap by 50% across the high school transition (Borman et al., 2018).

Yet, as Borman (2017) suggested, open questions remain concerning whether self-affirmation may be leveraged as a replicable approach to closing achievement gaps at scale. Recently reported results of a district-wide scale-up of self-affirmation suggest that the academic benefits can persist over several years, including the first year of high school (Borman et al., 2018). Are these positive impacts on students' achievement trajectories sustained through the end of secondary school? More importantly, can these impacts fundamentally change African American and Latino students' future academic and career opportunities by propelling them to successful, on-time graduation from high school?

Sustainability of Intervention Impacts

By intervening to buffer minority students from the harm and associated detrimental psychological, physiological, and behavioral consequences of stereotype threat, a well-timed self-affirmation exercise can lead to proximal improvements, such as a better grade on an important assignment or a higher test score on a high-stakes test. Yet, prior studies of self-affirmation typically discontinue the administration of the interventions after a single school year. In the absence of intervention, how do its benefits persist over many school years? Indeed, the field of education is replete with examples of far more intensive interventions that have had promising early impacts on both cognitive and socioemotional outcomes, but have failed to produce lasting impacts (Bailey, Duncan, Odgers, & Yu, 2017).

Theoretical mechanisms that may explain the sustained effects of self-affirmation include recursive processes (Purdie-Vaughns et al., 2009; Cohen & Sherman, 2014) and developmental cascades (Masten et al., 2005; Masten & Cicchetti, 2010). Cohen and Sherman (2014) suggest that incremental improvements in academic performance can affirm the self, leading to still better performance, which further affirms the self in a recursive process (Cohen & Sherman, 2014). These quick wins can accumulate, and students may begin to internalize a new conception of personal adequacy, which may help in overcoming the next adversity they face, thus further strengthening students' personal narratives in a repeating cycle (Cohen & Sherman, 2014). When such improvements are also witnessed by teachers and other students, they may begin to see threatened students as more able (Purdie-Vaughns et al., 2009), and provide further encouragement and support for academic success. Recent work by Brady et al. (2016) suggests that, eventually, threatened students may even spontaneously reassert their self-affirmations when they face future threats. Similarly, developmental cascade theory, which suggests the possibility that adaptive functions or behaviors can grow and spread over time to promote human development, also may explain how small successes can predict subsequent accomplishments across multiple domains (Kohlberg, LaCrosse, & Ricks, 1972; Masten & Cicchetti, 2010).

By targeting adolescence and the early stages of identity formation—a time during which threatened students may begin to question their social and academic belonging in school—well-timed affirmations also may help prevent *negative* cascades or recursive processes. As noted previously, adolescents in general, and African American and Latino students in particular, tend to experience negative trajectories on a variety of measures of academic performance and social and academic well-being in school. Indeed, the relatively large and growing impacts of a brief, but well-timed, self-affirmation intervention may simply signal the diverging pos-

itive and negative recursive trajectories experienced by, respectively, those benefitting from affirmation and those experiencing this difficult social and academic transition without intervention (Cohen et al., 2009; Harackiewicz & Priniski, 2018).

The Present Study

In the current study, we tested the sustained academic impacts of a district-wide self-affirmation implementation, originally administered to seventh-grade students during the 2011–2012 school year. The longitudinal results presented here investigate the extent to which the impacts for African American and Latino students persisted through the end of high school, 2016–2017, which was the students' 12th-grade year.

Based on prior findings (Cohen et al., 2006; Cohen et al., 2009; Good, Aronson, & Inzlicht, 2003; Sherman et al., 2013), we have no theoretical or empirical reason to believe that African American and Latino students respond to self-affirmation differently from one another, on average, and have no expectation that nonnegatively stereotyped Asian and white students will benefit academically from intervention (Cohen et al., 2006; Cohen et al., 2009; Sherman et al., 2013). In our analyses, we identify two groups of students: those who are potentially subject to stereotype threat (African American and Latino students) and those who are not potentially subject to stereotype threat (Asian and white students). We use the word *potentially* because these racial/ethnic classifications are simple proxies for students who typically suffer from stereotype threat. Prior research suggests that stereotype threat includes a number of boundary conditions that are difficult to identify in a large, field-based trial, such as awareness of the stereotype (Steele & Aronson, 1995) or identification with the academic domain (Aronson et al., 1999). In laboratory settings, researchers can more readily screen participants on these conditions than they can in field experiments. As a practical matter, in field settings, researchers generally assume that all African American and Latino students are *potentially* threatened because of the unfortunate reality that very few middle school students are unaware of their membership in a negatively stereotyped group and that identity threats can undermine students' academic performance regardless of their personal endorsement of the stereotype and their strength of group identification (Steele & Aronson, 1995; Steele et al., 2002).

Research Questions

Our general research question is: Can self-affirmation alter African American and Latino students' academic trajectories and, ultimately, their high school attainment outcomes, when the intervention is delivered at scale in a real-world setting? As our literature review suggested, the transition to middle school, and then to high school, tends to depress the GPAs of all students, yet the academic outcomes of Latino and African American students tend to show more marked declines over this period. In addition, these steeper declines in academic performance for potentially threatened students may, over time, provoke academic disengagement through negative developmental cascades or recursive processes. These accumulating negative outcomes and experiences may, ultimately, cause African American and Latino students to protectively disidentify from the academic domain, which may be signaled by dropping out of school. In contrast, African American and Latino students who have the opportunity to engage in self-affirmation writing may be buffered from stereotype threat such that they suffer slighter declines in school performance over time. Specifically, we evaluate the following key research questions:

Do the academic trajectories of nonstereotyped Asian and white students, as measured by their GPAs, show declines over time from Grade 7 through 12?

Do the GPA trajectories for potentially threatened African American and Latino students reveal steeper declines from Grade 7 through 12 relative to their nonstereotyped Asian and white peers?

Does assignment to a Grade 7 self-affirmation intervention mitigate a Grade 7 through 12 GPA performance decline for students potentially subject to stereotype threat?

Does assignment to a Grade 7 self-affirmation intervention increase the likelihood of on-time graduation among potentially threatened African American and Latino students?

Method

Data and Sample

Data for the study come from a district-wide randomized field trial implemented in all 11 middle schools in the Madison Metropolitan School District (MMSD) in 2011–2012. During the baseline year (2011–2012), the 11 middle schools ranged in size from 251 to 717 students and during the students' baseline year in the 4 MMSD high schools (2013–2014), the high school enrollments ranged from 1,478 to 2,035. Prior evidence has suggested that a relatively small representation of potentially threatened students within a school and relatively large achievement disparities between threatened and nonthreatened students can amplify identity threats and increase the buffering effects of self-affirmation (Borman et al., 2018). Publicly available enrollment and achievement data highlight this contextual variation. Within the 11 middle schools during the baseline year of 2011–2012, the percentage of potentially threatened minority students ranged from 16% to 78%. The 2011–2012 state standardized test scores for the middle schools show Grade 7 reading achievement gaps from 0.36 standard deviation (*SD*) units to 2.14 *SD* units. Interestingly, these contextual cues, which may moderate the impacts of self-affirmation, were more uniform and potentially threatening across the district's high schools. Within the 4 MMSD high schools, potentially threatened students were consistently the numerical minority, ranging from 29% to 41% of the schools' student enrollments during the sampled students' first year of high school in 2013–2014. Also, the high school reading test score gaps of 1.18 *SD*s to 1.87 *SD* units were uniformly large at approximately twice the magnitude of the national averages found by Musu-Gillette et al. (2017) on the *NAEP* assessments.

Institutional Review Board (IRB) review and approval was provided by the University of Wisconsin—Madison Education and Social/Behavioral Science IRB (ID #2012–1055-CR007) and the study procedures were also reviewed and approved by the MMSD Education Research Committee. The study team sought parent consent and student assent prior to the beginning of the school year during student enrollment day at each of the participating middle schools. Among the 1,706 seventh-grade students enrolled in

MMSD, according to the official count during the fall of the baseline year of 2011, parental consent and student assent were obtained for 61% of the district population (n = 1,048) prior to fielding the intervention. We define two longitudinal, seventh through 12th grade, student samples for analysis: an analytic sample of 804 students with complete baseline demographic data and GPA records from seventh through 12th grade; and a sample of 952 students with complete baseline demographic data and high school graduation information. Within these overlapping student samples, 803 students have complete demographic data, GPA data, and graduation outcomes.

Though baseline data come from a single source—the MMSD official student transcript records—these two longitudinal student samples resulted from two distinct sources of outcome data. The GPA data came from the MMSD official transcript data files, and the graduation data came from the Wisconsin Information System for Education data (WISEdata), which is maintained by the state Department of Public Instruction. The MMSD data are complete for all students who remain enrolled in a district public school through 12th grade. The WISEdata are complete for all students who remain within a Wisconsin public school through the 2016–2017 school year, or who are confirmed to have died or dropped out prior to the completion of the 2016–17 school year.

Within the GPA outcome sample, there are 399 and 405 students in the control and treatment groups, respectively. Overall, student attrition rates for the full sample and potentially threatened subsamples were 23% and 33%, respectively. Treatment and control groups experienced statistically equivalent rates of attrition both in the full sample and the subsample of potentially threatened students. The differential attrition rate is 1% in the full sample (23% for treatment, and 24% for control), $\chi^2(1, N = 804) = .06, p = .82$) and 2% in the subsample of potentially threatened students (32% for treatment, and 34% for control), $\chi^2(1, N = 621) = .11, p = .75$). This combination of overall and differential attrition rates falls into the "tolerable level of potential bias" according to What Works Clearinghouse standards (What Works Clearinghouse, 2020).

As summarized in Table 1, the overall GPA outcome sample was composed of 32% potentially threatened students, 51% female students, 15% Limited English Proficient (LEP) students, 35% who were eligible for free or reduced-price lunch, and 11% who were classified as requiring special education services. The overall mean baseline, cumulative sixth-grade GPA for the sample was 3.35 with a standard deviation of 0.59. Students in the potentially threatened sample had a lower sixth-grade GPA than students overall, with a mean of 2.92 and a standard deviation of 0.62. All baseline variables for the treatment and control groups were statistically equivalent, both for the full sample and for the potentially threatened subsample. In the potentially threatened student subsample, there were slightly more Latino students in the control group than in the treatment group, with 47% and 36% respectively. This difference, however, is not statistically significant at the conventional p value of .05. As such, aside from the causal independent variable of interest, treatment status, the two groups have comparable baseline characteristics.

Attrition rates for the graduation outcome sample accessed from WISEdata were lower than those noted for the GPA outcome sample with no differential attrition between the treatment and control groups. The student attrition rates for the full sample and potentially threatened subsamples were 9% and 13%, respectively.

Table 1
Baseline Characteristics for GPA Outcome Sample

Variable	Overall	Control	Treatment	p value
All students				
Potentially threatened	32%	33%	32%	.94
African American	11%	10%	12%	.30
Latino	13%	15%	12%	.13
Asian	10%	09%	10%	.52
American Indian	1%	1%	1%	.99
White	56%	58%	55%	.46
Multiracial	9%	7%	10%	.19
Female	51%	53%	49%	.29
Limited English proficiency	15%	16%	14%	.28
Free/reduced lunch eligible	35%	34%	36%	.51
Special education services	11%	10%	12%	.25
Prior GPA	3.35 (0.59)	3.37 (0.57)	3.32 (0.60)	.24
N	804	399	405	
Potentially threatened students				
African American	34%	31%	38%	.21
Latino	41%	47%	36%	.07
American Indian	2%	2%	2%	.99
Multiracial	22%	20%	24%	.47
Female	48%	51%	45%	.35
Limited English proficiency	31%	36%	27%	.10
Free/reduced lunch eligible	75%	75%	75%	.97
Special education services	16%	15%	18%	.52
Prior GPA	2.92 (0.62)	2.95 (0.64)	2.88 (0.61)	.36
N	261	130	131	

Note. Standard deviations in parentheses; Treatment-control differences for binary variables tested with two-sample proportion test and scale variables tested with two-sample t-test (H_0: T–C = 0).

For the overall analytical sample of 952, attrition rates for the treatment (9%) and control (10%) groups were statistically equivalent ($\chi^2(1, N = 952) = .65, p = .72$). After dropping cases with missing information on graduation status for the sample of potentially threatened students, the final sample size was 341, and the attrition rates for the treatment and control groups for the potentially threatened sample were 11% and 14%, respectively, ($\chi^2(1, N = 341) = .95, p = .62$). As shown in Table 2, the baseline characteristics of the graduation outcome sample are similar to those of the GPA sample. In addition, the results summarized in Table 2 reveal that the preintervention characteristics of the treatment and control groups, for both the overall sample and potentially threatened subsample, are statistically equivalent. Table 3 summarizes the grade-by-grade GPA outcomes, across grades 7 through 12, for all students and for the potentially threatened student subgroup. In addition, Table 3 indicates the on-time graduation rates for all students and for potentially threatened students.

Table 3
GPA Outcomes by Grade and 12th-Grade On-Time Graduation Outcomes

Outcome	*M*	*SD*	Min	Max
All students ($N = 804$)				
Grade 7 GPA	3.25	0.68	0.46	4
Grade 8 GPA	3.24	0.66	0.85	4
Grade 9 GPA	3.10	0.86	0.00	4
Grade 10 GPA	3.04	0.88	0.05	4
Grade 11 GPA	3.01	0.90	0.00	4
Grade 12 GPA	3.01	0.86	0.00	4
Potentially threatened students ($N = 261$)				
Grade 7 GPA	2.78	0.72	0.46	4
Grade 8 GPA	2.80	0.70	0.85	4
Grade 9 GPA	2.50	0.98	0.00	4
Grade 10 GPA	2.42	0.98	0.05	4
Grade 11 GPA	2.38	0.99	0.00	4
Grade 12 GPA	2.46	0.94	0.00	4
On-time graduation outcome				
All students ($N = 952$)	0.90	0.30	0	1
Potentially threatened students ($N = 341$)	0.81	0.39	0	1

Intervention Procedure

The four exercises that comprised the intervention were designed to closely replicate the self-affirmation writing activities previously fielded by Cohen et al. (2006, 2009). We worked with principals and teachers to develop final versions of the exercises, with the intention of offering materials resembling those that they would assign their students as normal instructional routine. The instructions and script provided to teachers were further intended to frame the writing activities as typical classroom activities, and our trainings and materials urged teachers to present the exercises as such and avoid mention of the activity as an external research project. These methods correspond with prior evidence regarding best practices, which suggest that students not be told that the intervention is externally imposed (Silverman, Logel, & Cohen, 2013) and that the exercises should resemble normal classroom activities delivered by teachers who may care to know more about their students' most important values (Cohen et al., 2006; Cohen & Sherman, 2014; Purdie-Vaughns et al., 2009).

Students were randomly assigned, within each of the 11 school-level blocks, to treatment and control conditions and were assigned

Table 2
Baseline Characteristics for On-Time Graduation Outcome Sample

Variable	Overall	Control	Treatment	*p* value
All students				
Potentially threatened	36%	36%	35%	.83
African American	12%	11%	13%	.36
Latino	14%	16%	12%	.14
Asian	9%	9%	9%	.87
American Indian	1%	1%	1%	.69
White	54%	54%	54%	.83
Multiracial	10%	9%	11%	.32
Female	50%	52%	48%	.33
Limited English proficiency	15%	17%	13%	.10
Free/reduced lunch eligible	38%	39%	38%	.58
Special education services	14%	13%	14%	.50
Prior GPA	3.26 (0.64)	3.27 (0.65)	3.25 (0.63)	.68
N	952	473	479	
Potentially threatened students				
African American	34%	31%	37%	.24
Latino	39%	43%	35%	.10
American Indian	2%	2%	2%	.71
Multiracial	25%	23%	26%	.51
Female	48%	50%	46%	.42
Limited English proficiency	30%	35%	25%	.05
Free/reduced lunch eligible	76%	78%	74%	.30
Special education services	19%	19%	19%	.91
Prior GPA	2.84 (0.64)	2.83 (0.67)	2.84 (0.61)	.80
N	341	171	170	

Note. Standard deviations in parentheses; Treatment-control differences for binary variables tested with two-sample proportion test and scale variables tested with two-sample *t*-test (H_0: T–C = 0).

the writing exercises during the 2011–2012 school year. The first exercise was scheduled as close to the beginning of the school year as possible. This is consistent with the findings of Critcher, Dunning, and Armor (2010), who found that self-affirmation exercises were effective only when introduced before a threat or before participants became defensive in response to a threat, which suggests that it is important to implement self-affirmation exercises before stressful events in school in order to short-circuit negative recursive cycles (see also Cohen & Garcia, 2008; Cook et al., 2012). The three exercises that followed were administered prior to district-wide assessments in order to buffer stereotyped treatment students across the district from social-identity threats potentially triggered by these important evaluative events.

The exercises presented students with a list of things that may be important to them or others (e.g., family and friends, religion, art, sports, and music). Treatment students were asked to select and write a short passage about two or three of the items most important to them. Control students were asked to select the two or three items of least value to them and write about how they might be important to others. The third and fourth exercises were modified slightly from the first two exercises to promote continued student engagement but included similar directions.

To maintain randomization adherence and implementation fidelity, students received personalized copies of materials with the same cover sheet and similar overall appearances and were instructed to complete their exercises quietly and independently at their desks. The design was a double-blind experiment, as neither students nor teachers were informed of treatment assignment or any concepts, purposes, or hypotheses associated with the study, such as stereotype threat and self-affirmation. Each 15- to 20-min exercise was administered as part of normal classroom activities in a homeroom (four schools) or English/language arts class (seven schools) so as not to be seen as an external research project by students. Students completed the assignments quietly and independently; teachers collected the completed exercises and returned them to the research staff without reviewing student responses. Exchanges of materials were conducted via school administrators or in the few cases in which research staff interacted directly with classroom teachers, when students were not present.

Measures

GPA outcomes. We used student grade point averages (GPAs) based on transcript data provided by the MMSD as an outcome measure. Students' GPAs not only represent academic performance but also reflect social-behavioral aspects such as attendance, effort, and engagement in the classroom. We therefore investigated students' GPAs as a proxy indicator to evaluate not only their academic performance, but also their accumulative effort and engagement in school tasks. Consistent with prior studies of self-affirmation (Cohen et al. 2006, 2009; Sherman et al., 2013), we focused on "core" subjects (i.e., math, science, language arts, and social studies) rather than electives. Sherman et al. (2013) argued that core academic courses reflecting students' intellectual ability are "more consistently stereotype relevant." We calculated students' average GPA for each term based on the MMSD protocol. We converted student letter grades into a four-point scale (e.g., A = 4.0, B = 3.0, etc.) and computed an overall average GPA in core subjects. MMSD middle schools all have the same quarterly system, while high schools have either quarterly or semester systems according to individual school policies. We averaged the GPAs of two terms for high schools with quarterly systems to correspond to the format of the semester system.

Graduation outcomes. The Wisconsin Information System for Education data (WISEdata) provided information that allowed us to code whether or not students attained on-time high school graduation during the 2016–2017 school year. The data file contained yearly information from the baseline, 2011–2012 seventh-grade year through the 2016–2017 school year. For each student in the sample, the file provided an annual exit code and annual high-school completion status outcome. These data allowed us to identify three possible yearly outcomes for each student: (a) graduated high school; (b) left the Wisconsin state public education system (i.e., out of state, attending private school, deceased); and (c) not yet graduated or dropped out. The on-time graduation status of students who left the state public education system was indeterminate and these cases were coded as having missing data. Students whose final code indicated that they had graduated high school by 2016–2017, or earlier, were coded as "on-time graduates."

Potentially threatened status. Demographic data provided by the district allowed us to operationalize the potential vulnerability to stereotype threat of each student. Using each student's parent-reported racial/ethnic group membership, we coded students as "potentially threatened" or "non-potentially threatened" within the academic domain. Students reported as African American or Latino were coded as potentially vulnerable to stereotype threat. Multiracial students were considered potentially vulnerable if African American or Latino was reported by their parents as part of their racial/ethnic identity. Finally, the 6 American Indian students in the GPA outcome sample and 7 students in the on-time graduation outcome sample were coded as potentially threatened.

Our coding approach was commensurate with prior research that has shown no impact of self-affirmation for white and Asian students and positive, statistically significant impacts of similar magnitudes for African American (Cohen et al., 2006) and Latino (Sherman et al., 2013) students. We conducted a number of sensitivity analyses to test this classification decision. We did not find meaningful differences within the potentially threatened group (e.g., African Americans vs. Latino students). We also reclassified multiracial students by, for instance, assigning students identified as African American and white to the group that is not potentially vulnerable to stereotype threat, and found substantively similar results. As one might expect, the magnitudes of the impacts of self-affirmation for multiracial students were between those of the potentially threatened and not potentially threatened groups, which yielded larger impact estimates for the potentially threatened group when the multiracial students were reassigned. These supplemental sensitivity analyses are available from the authors upon request.

Covariates. We also included student demographic characteristics, school fixed effects, and a measure of preintervention achievement to control statistically for small, preexisting differences among students and to improve the precision of the GPA and graduation model estimates. Demographic covariates gleaned from the district data files included: gender, free or reduced lunch status (as a proxy for socioeconomic status), limited English proficiency status, and special education status. The students' cumulative GPA in sixth grade, a continuous variable on a 4-point scale, served as a baseline measure of prior achievement.

Data Analysis

We used growth curve modeling based on a multilevel framework (Raudenbush & Bryk, 2002; Singer & Willett, 2003) to investigate the sustained effects of self-affirmation on students' GPAs. This method allowed us to assess the effect of the intervention on both the final 12th-grade time-point and the longitudinal trajectory of GPA from seventh grade through 12th grade. Given our research questions, we centered the intercept at the end term of 12th grade. We included indicator variables to represent as fixed effects the 11 school-level randomization blocks. Though a more complicated three-level model—with schools represented at level-three of the multilevel model—is possible, supplemental analyses suggested that the proportion of school-level variability in a three-level model is extremely small. Because no substantive variation in students' GPA outcomes was associated with school-to-school differences, we formulated our models to account for the fixed effects of the 11 middle schools within which students were originally randomized.

The fully specified model is as follows:

$$\begin{aligned} GPA_{it} = {} & \beta_{00} + \beta_{01}Affirmed_i + \beta_{02}Threatened_i \\ & + \beta_{03}Affirmed_i \times Threatened_i + \beta_{10}Year_t \\ & + \beta_{11}Affirmed_i \times Year_t + \beta_{12}Threatened_i \times Year_t \\ & + \beta_{13}Affirmed_i \times Threatened_i \times Year_t + \beta X_i + \eta_i + \varepsilon_{it} \end{aligned}$$

where the outcome, *GPAti*, represents the GPA of student *i* at time *t*, with time measured in the number of years prior to the end of 12th grade ($t = 0$ is the end of 12th grade). We applied this coding of time so that main effects in the model for treatment and potentially threatened students represent differences at the end of high school. The impact of the intervention on end-of-year 12th-grade GPA for students not subject to stereotype threat is the coefficient β_{01} The additional impact for potentially threatened students is the coefficient β_{03}. We expected the estimate for β_{01} to be null and the estimate for β_{03} to be positive, indicating that academic benefits for potentially threatened students persisted through the end of 12th grade. Beyond these end-of-12th-grade estimates, the growth model allowed us to further examine how posttreatment student GPAs changed over time. The coefficient β_{10} represents the overall trend in posttreatment student GPA for nonthreatened control students, and the coefficient β_{12} is the difference in this trend for potentially threatened control students.

The estimate for β_{10} responds to research questions 1: Do the academic trajectories of students, as measured by their GPAs, show declines over time from Grade 7 through 12? The coefficient for β_{12} addresses research question 2: Do the GPA trajectories for potentially threatened African American and Latino students reveal steeper declines from Grade 7 through 12 relative to their nonstereotyped Asian and white peers? We expected the estimates for both of these coefficients to be negative, indicating a downward trend in GPA overall and a steeper decline for potentially threatened students.

Of primary interest is the estimate for β_{13}, which addresses research question 3: Does assignment to a Grade 7 self-affirmation intervention mitigate a Grade 7 through 12 GPA performance decline for students potentially subject to stereotype threat? This coefficient indicates the extent to which the intervention's effect on academic trajectory was stronger for potentially threatened students than for nonthreatened students. A positive value for this coefficient would suggest that the intervention improved the academic trajectories of potentially threatened students, relative to similar students in the control condition. Finally, the student covariates (i.e., sixth-grade GPA, gender, eligibility for free and reduced-price lunch, special education status, limited English proficiency, and indicator variables for schools), are represented by the expression $\beta\mathbf{X}_i$. This vector of covariates was included to increase the precision of the impact estimates by accounting for more variance in the outcome variable and to account for small, chance differences between treatment and control students.

To respond to our final research question, we applied logistic regression to assess: Does assignment to a Grade 7 self-affirmation intervention increase the likelihood of successful, on-time graduation among potentially threatened African American and Latino students? Two important complexities required attention when estimating the logit models. First, within one of the 11 school randomization blocks, all control and treatment students graduated on time ($n = 45$). Given that the binary dependent variable was a constant within this school-level block, the school fixed-effect indicator for the block perfectly predicts the on-time graduation outcome and, thus, results in the problem of complete separation. To address this problem, we employed a penalized maximum likelihood estimation (PMLE) approach proposed by Firth (1993).[1] PMLE has the advantage of producing finite, consistent estimates of regression parameters when the maximum likelihood estimates do not exist because of complete or quasi-complete separation. This method has been demonstrated to produce more reliable results in empirical studies than other alternate options when separation or monotone likelihood is observed in fitting a logistic model (Heinze & Schemper, 2002).

Second, as in our growth model for the GPA outcomes, an important outcome of interest is the extent to which the treatment effect differs by students' potentially threatened status. However, increasingly researchers have noted the potential pitfalls of modeling such interactions in logit or probit models (Allison, 1999; Long & Mustillo, 2018; Williams, 2009). For instance, Long and Mustillo (2018) discuss a number of unfavorable properties of interaction terms in binary outcome models, citing prior literature that shows unequal residual variance across groups can be particularly problematic for interaction estimates (Allison, 1999; Williams, 2009). Indeed, with regard to this issue, Mustillo, Lizardo, and McVeigh (2018) stated that "the case is closed: don't use the coefficient of the interaction term to draw conclusions about statistical interaction in categorical models such as logit, probit, Poisson, and so on" (p. 1282). Rather than modeling an interaction term, we employed an alternate approach suggested by Long and Mustillo (2018).

Long and Mustillo (2018) propose independently estimating the simple effects for the groups for which an interaction is hypothesized—in our case, potentially threatened and nonthreatened students—via marginal estimates. Following these methods, we begin by estimating the following logit model for each group, potentially threatened and nonthreatened:

[1] Specifically, we used the "firthlogit" command in Stata.

Table 4
Estimates From Growth Models of GPA From Grades 7–12 by Term

Effect	Main	Main: full covariates	Simple effects: all students	Simple: threatened
Intercept (End of Grade 12)	3.39* (0.06)	0.05 (0.11)	−0.02 (0.11)	−0.22 (0.21)
Potentially threatened group	−0.96* (0.07)	−0.43* (0.05)	−0.19* (0.04)	
Self-Affirmation × Threatened	0.13 (0.09)	0.17* (0.06)		
Years (slope)	−0.04* (0.004)	−0.04* (0.004)	−0.06* (0.003)	−0.10* (0.01)
Years × Threatened	−0.06* (0.01)	−0.06* (0.01)		
Years × Treatment	−0.01 (0.01)	−0.01 (0.01)	0.001 (0.004)	0.02* (0.01)
Years × Self-Affirmation × Threatened	0.03* (0.01)	0.03* (0.01)		
Self-affirmation	−0.06 (0.05)	−0.03 (0.04)	0.03 (0.03)	0.14* (0.06)
Grade 6 GPA		0.90* (0.03)	0.90* (0.03)	0.86* (0.05)
Female		0.11* (0.03)	0.11* (0.03)	0.18* (0.06)
Limited English proficiency		0.10* (0.04)	0.10* (0.04)	0.11+ (0.06)
Special education		0.10* (0.04)	0.10* (0.04)	−0.02 (0.08)
Free/reduced lunch		−0.12* (0.04)	−0.12* (0.04)	−0.26* (0.07)
Var (Student)	0.32* (0.02)	0.11* (0.01)	0.11* (0.01)	0.17* (0.02)
Var (Within)	0.20* (0.003)	0.20* (0.003)	0.20* (0.003)	0.32* (0.01)
Observations by term	12798	12798	12798	4147
Student *N*	804	804	804	261

Note. All models include school fixed effects (not shown); standard errors in parentheses.
+ $p < .10$. * $p < .05$.

$$logit(Graduation_i) = \alpha + \beta_1 Affirmed_i + \beta X_i + \varepsilon_i$$

where $logit(Graduation_i)$ is the predicted log odds of on-time graduation for student i, β_1 represents the change in the log odds of on-time graduation predicted by treatment, and the vector $\beta \boldsymbol{X}$ includes the student covariates and indicator variables for the 11 schools. We next estimate marginal effects at the two respective group means because the preexisting differences on some of the covariates are large. For instance, given that potentially threatened students lag nonthreatened students by approximately three-quarters of one standard deviation on the baseline GPA measure, there are few potentially threatened students at the sample mean. Therefore, following the recommendations of Long and Mustillo (2018) we calculate the average discrete change (ADC) to assess the difference in the treatment effect across groups averaged across the distribution of baseline covariates.

Because impact estimates reported in probability units can be more intuitive than those expressed in logits or odd-ratios we converted the logit-based coefficients into probability units. The results of the logit model provide the natural logarithm of the odds ($\log(\frac{\pi}{1-\pi})$) and the odds ($\frac{\pi}{1-\pi}$) represent the relative chance of an event—in this case, on-time graduation. The ADC methods proposed by Long and Mustillo (2018) suggest using predicted probabilities and marginal effects on probabilities for the binary logit model to compare the group differences and provide useful interpretation in practice. Thus, the logit-based coefficients were converted to probabilities (π), ranging from 0 to 1, with the *Margins* command in Stata, to compute the ADC. We then compared the intervention effects for the two groups to test whether the average effects of the intervention are statistically different for potentially threatened students and nonthreatened students.[2]

Results

GPA Outcome

The results from the multilevel growth-curve model are presented in Table 4, while Figure 1 presents the unadjusted GPA trend from seventh through 12th grade. The first column in Table 4 presents the main effects before controlling for any covariates. The second column shows the main effects estimated by the fully specified model, which controls for the full set of covariates. The third and fourth columns show the simple treatment effects in the overall sample and potentially threatened sample, respectively, after statistically controlling all covariates, demonstrating the results without the interaction terms of intercept and slope: Treatment × Potentially Threatened group, and Year × Treatment × Potentially Threatened group.

The treatment has no statistically significant impact on students' GPA for the overall student sample or nonthreatened group. The treatment impact for the overall student sample is 0.026 (95% confidence interval [CI: −0.03, 0.08], $z(0.89)$, $p = .38$), which represents the GPA gap between treatment and control students at the end of Grade 12. The simple effect of treatment for white and Asian students is not statistically significant, either ($\beta = -0.03$, 95% CI [−0.10, 0.04], $z(-0.89)$, $p = .38$).

As we hypothesized, though, the self-affirmation intervention had a statistically significant impact on student GPA for the potentially threatened group, $\beta = 0.17$ (95% CI [0.05, 0.30], $z(2.83)$, $p = .005$). In the absence of intervention, white and Asian students achieved a GPA that was 0.43 points higher than the GPA of potentially threatened students at the end term of 12th grade. In the treated condition, however, this large GPA gap between nonthreatened and potentially threatened student groups was reduced by over 40%, from 0.43 to 0.25 points.

As hypothesized, across the seventh through 12th grades, all students experienced statistically significant declines in GPA, though potentially threatened students suffered statistically greater declines. The intervention, however, mitigated this decline in GPA

[2] We computed the marginal effects of treatment for each group (threatened and nonthreatened students) and tested whether the null hypothesis that the difference of the two coefficients is zero using the *mlincom* post-estimation command found within the *SPost13* package of Stata (Long & Freese, 2014).

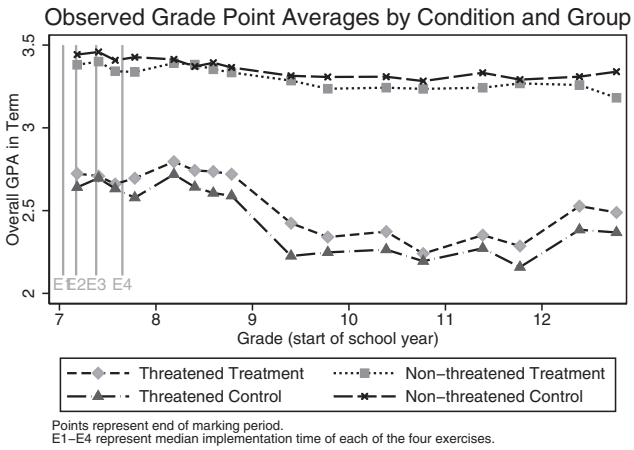

Figure 1. Unadjusted GPA trends by treatment condition and students' group (potentially threatened status by treatment status).

for potentially threatened students ($\beta = 0.03$, 95% CI [0.01, 0.05], $z(2.94)$, $p = .003$). That is, from seventh through 12th grade, the achievement gap between white and Asian and potentially threatened students widened, on average, by over 0.06 GPA points per year ($\beta = -0.06$, 95% CI [−0.07, −0.05], $z(-8.85)$, $p < .001$), resulting in a 0.43 point GPA gap at the end term of 12th grade. The treatment reduced this growing gap by 50% per year, from 0.06 to 0.03 GPA points per year.

In order to check the robustness of the main growth model, we also evaluated GPA trajectories using four alternative specifications, which are summarized in Figure 2: (a) the specified linear trend model from our main growth model; (b) a linear model with grade intercepts; (c) a linear model with grade intercepts and yearly slopes; (d) a quadratic slope model; and, (e) a cubic slope model. In these more flexible, nonlinear models, we noted that students experienced a relatively large GPA decline during the transition from middle school to high school and displayed some recovery from the end of 11th grade through the end of 12th grade. Nevertheless, these alternate models for the GPA trend provide a similar story confirming the central findings from our final model. Potentially threatened students tend to experience a more rapid GPA decline relative to their nonthreatened counterparts and, thus, they eventually performed worse than their nonthreatened peers in 12th grade. The self-affirmation intervention, however, narrowed the GPA gap at the end of high school by reducing the statistically significantly greater decreasing trend for potentially threatened students.

On-Time Graduation Outcome

We also assessed whether self-affirmation impacted on-time graduation rates for the potentially threatened and nonpotentially threatened groups. Table 5 summarizes the estimates from the logit models for the targeted potentially threatened sample and for the nonthreatened sample, respectively. The first column shows the simple treatment effects for the threatened students before adjusting for the covariates and the second column displays the simple effects estimated by the fully specified model, after statistically controlling for the full set of covariates. In the third and fourth columns of Table 5, we present, respectively, the simple effects for the nonthreatened sample without and with covariate adjustment.

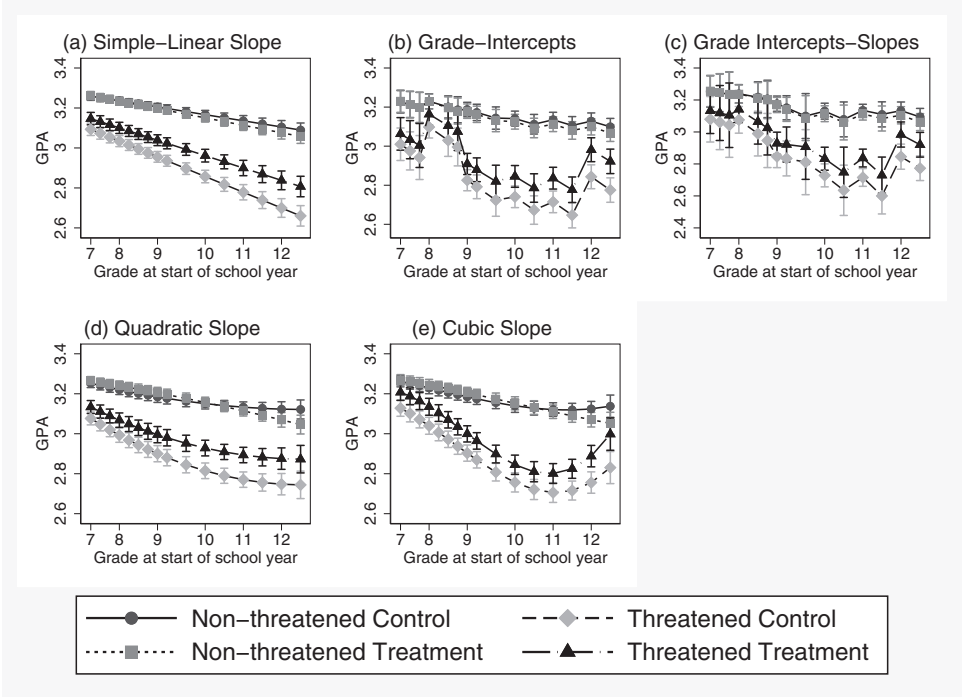

Figure 2. Robustness checks from alternate GPA growth-model specifications by students' group (potentially threatened status by treatment status).

Table 5
Estimates of 12th-Grade On-Time Graduation Outcomes

	Threatened		Nonthreatened	
Simple effects	No covariates	Full covariates	No covariates	Full covariates
Intercept	1.14* (0.18)	−1.80 (1.20)	2.80* (0.25)	−0.13 (1.63)
Self-affirmation	0.69* (0.28)	0.71* (0.31)	0.22 (0.36)	0.48 (0.44)
Grade 6 GPA		1.05* (0.29)		1.00* (0.44)
Female		0.39 (0.31)		0.37 (0.43)
Limited English proficiency		0.19 (0.34)		0.02 (0.70)
Special education		−1.06* (0.35)		−1.90* (0.50)
Free/reduced lunch		−0.72 (0.48)		−0.34 (0.48)
Student *N*	341	341	611	611

Note. The models with full covariates include school fixed effects (not shown); standard errors in parentheses; All coefficients are log-odds.
* $p < .05$.

The first and second columns show that the self-affirmation intervention has a statistically significant impact on on-time graduation for the potentially threatened students in both unadjusted and covariate-adjusted logit models. The results from the fully specified model displayed in the second column indicate that the intervention effect for potentially threatened students is statistically significant ($\beta = 0.71$, 95% CI [0.10, 1.31], $z(2.27)$, $p = .02$). As shown in the third and fourth columns, the intervention did not have a statistically significant impact for nonthreatened students ($\beta = 0.48$, 95% CI [−0.33, 1.28], $z(1.16)$, $p = .25$). These simple treatment effects from the logit-based models indicate the possible differential treatment effects for the threatened and nonthreatened samples that we hypothesized.

To examine whether the intervention effects were statistically different for threatened and nonthreatened students, we tested for this group difference using the ADC method. As previously discussed, we converted the logit-based results to probabilities to facilitate interpretation. As such, the self-affirmation intervention increased the probability of on-time graduation by 0.01, or 1 percentage point, for nonthreatened students, which is not statistically significant ($p = .32$), but increased the probability of on-time graduation by 0.10, or 10 percentage points, for potentially threatened students, which is statistically significant ($p = .01$). The result from the test of the equality of these probabilities revealed that these treatment effects for the potentially threatened and nonthreatened samples differ by 0.09, or 9 percentage points, which is a statistically significant difference ($\beta = 0.08$ (95% CI [0.01, 0.16], $z(2.09)$, $p = .04$).

These outcomes confirm our primary hypotheses, that the intervention positively impacts on-time graduation outcomes for potentially threatened students, whereas it has no statistically significant effects on nonthreatened students. In addition, the estimates of these treatment effects for the two groups are statistically different. Based on the converted probabilities, these results suggest that potentially threatened students who were randomly assigned to receive the self-affirmation intervention in middle school tended to graduate on time from high school at a rate that was approximately 10 percentage points higher than that of their nontreated threatened counterparts. As shown in Figure 3, the treatment effect cut in half the unadjusted gap between potentially threatened students and Asian and White students, reducing the on-time graduation rate difference from 18.35 percentage points, within the control group displayed to the left, to 8.99 within the treated group shown to the right of the figure.

Discussion

Though affirmation interventions have previously shown compelling short- and longer-term outcomes in a small number of schools and classrooms, the results presented here suggest the potential for widespread and enduring benefits for both African American and Latino students whose social-psychological identities are potentially threatened. Indeed, our impact estimates reveal sustained benefits for students of color, cutting the yearly growth of the achievement gap separating African American and Latino students from their white and Asian peers by 50% across grades seven through 12 and narrowing the gap on the final 12th-grade GPA by over 40%. Driven, in part, by these impacts of affirmation on students' grades, potentially threatened students also realized on-time graduation rates that are 10 percentage points higher than those of their nontreated counterparts. This district-wide impact on graduation rates cut in half the on-time graduation gap between potentially threatened and nonpotentially threatened students.

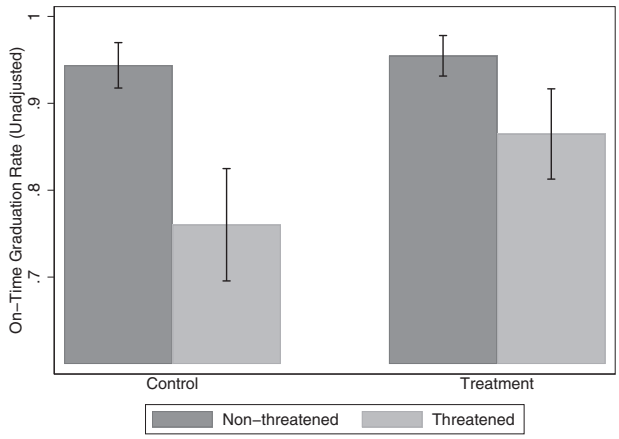

Figure 3. Unadjusted on-time graduation rates for potentially nonthreatened and threatened students by treatment status.

For decades, the national achievement gaps separating African American and Latino students from their white and Asian peers have remained large and stubbornly persistent (Musu-Gillette et al., 2017). In a recent analysis of the 2,500 school districts with a large enough sample of African American students to measure their achievement gaps, only one district had no African American-white gap—Detroit, MI—and rather than a success story the explanation was, instead, universally poor performance across all student subgroups (Reardon, Kalogrides, & Shores, 2019). Policies and programs specifically aimed at narrowing the achievement gaps separating racial/ethnic minority and majority students have been largely unsuccessful, as suggested by a recent meta-analysis of 30 such efforts, which revealed a nonstatistically significant overall impact (Jeynes, 2015). What may explain the success revealed by this district-wide scale-up of self-affirmation, and how did an intervention, which occupied only about an hour of students' time during seventh grade, have such profound and lasting academic impacts?

Ultimately, the goal of educational interventions is to initiate change in a particular area and sustain the desired outcome within and across educational periods. Although long-term recursive processes sustaining self-affirmation effects have been substantiated both theoretically and empirically, these studies have typically been implemented in small-scale field trials restricted to several classrooms. Though prior self-affirmation effects evidenced at scale are promising, it is critical to understand the conditions under which the effects of such interventions can be sustained and the types of processes that generate lasting impacts on students.

Recent theoretical research has provided such a perspective. Borman (2017) leverages theory and evidence from Bailey et al. (2017) to explain how self-affirmation interventions can generate enduring, policy-relevant impacts at scale. First, self-affirmation can be classified as a "trifecta" skill in that it is ". . . malleable, fundamental, and would not have developed in the absence of the intervention" (Bailey et al., 2017, p. 8). As Borman (2017) discusses, self-affirmation would not occur in the absence of being prompted to engage in the process, and being affirmed is a fundamental process to combating stereotype threat. Indeed, prior research suggests that control students receiving a similar, but nonaffirming, writing prompt engage in self-affirming writing at a rate of only 2% (Borman et al., 2018). Thus, without the receipt of the intervention writing prompt, evidence suggests that students will rarely demonstrate spontaneous self-affirming writing.

Bailey et al. (2017) point out another potential characteristic of successful interventions that produce enduring impacts: the "foot-in-the-door" hypothesis. Specifically, the authors offer the following perspective:

> . . . [F]oot-in-the-door views the intervention task as one of producing a potentially transitory augmentation of skills or beliefs that will sustain a child or adolescent through a period of risky environments or transitory opportunities to provide a solid foundation or entering the next developmental stage (e.g., from adolescence to adulthood). (p. 21)

Self-affirmation theory suggests that the "timeliness" of the intervention's delivery is crucial for success (Cohen & Sherman, 2014). Critcher et al. (2010) demonstrated that self-affirmation exercises were effective only when introduced just prior to a threat or before participants became defensive in response to a threat. This may suggest that it is important to implement self-affirmation exercises before stressful events in school in order to thwart the negative recursive cycles that may ensue in absence of intervention (see also Cohen & Garcia, 2008; Cook et al., 2012). Also, Cohen and Sherman (2014) suggest that self-affirmation should be well timed to the onset of key developmental transitions, such as, in this case, the onset of adolescence and racial/ethnic identity formation. Finally, findings from a field experiment by Cook et al. (2012) showed that when the intervention was implemented during the beginning week of school, it had a stronger effect on students' first-term class grades than when delivered several weeks later. This finding suggests that a self-affirmation intervention should be presented as early during the school year as possible, prior to the experience of adversity and before any corresponding decline in academic performance (Cohen & Sherman, 2014). In these ways, the timely delivery of self-affirmation interventions is aligned with the foot-in-the-door idea, in that precise theoretically- and practically timed application of a social-psychological theory, *self-affirmation*, can combat an educationally salient social-identity threat, stereotype threat, at the critical time of adolescence, which introduces myriad physiological, psychological, social, psychological, familial, and educational changes that can conspire to challenge the academic development of all adolescents, but the progress of Latino and African American students especially.

Framing self-affirmation effects in terms of a developmental cascade model (Masten et al., 2005; Yeager et al., 2014), foot-in-the-door interventions shift the momentum of negative developmental cascades to positive developmental cascades when implemented at the critical points in which students may be most vulnerable to identity threats, and most responsive to the intervention's self-affirming messages (Bailey et al., 2017). This timely interruption to a particular aspect of students' ongoing negative developmental cascades, such as recursive performance declines resulting from threatening social cues, can induce positive changes that propagate throughout a students' academic, social, and behavioral development to improve and sustain proximal and distal outcomes. These theoretical perspectives offer a basis for understanding the potential active ingredients underlying self-affirmation and provide an important context for understanding the current study's sustained impacts.

The third process by which Bailey et al. (2017) suggest school-based interventions can have sustained impacts is through the sustaining environments perspective, which suggests that exposure to high-quality environments subsequent to the completion of the intervention is crucial for sustaining its earlier impacts. Indeed, self-affirmation does not directly induce learning of new academic content, as a powerful new math or reading program might. Instead, the intervention unlocks African American and Latino students' *potential* to achieve, by effectively buffering them from the stereotypes that can degrade learning and academic performance in the absence of intervention. In this way, the hypothesized recursive benefits are theorized to depend on relatively rich learning environments for threatened students to take advantage of as they are buffered from perceived threats (Cohen & Sherman, 2014; Purdie-Vaughns et al., 2009). The Madison, Wisconsin community is consistently ranked within the

popular media among the nation's best places to live (e.g., Sim & Watling, 2019; Thorsby, 2019) and best places to raise children (e.g., Kiernan, 2018; Sim & Watling, 2018), with the high quality of the local schools playing an important role in those rankings.

In these particular ways, the three characteristics that Bailey et al. (2017) found to be important for interventions that show sustained educational impacts—the trifecta skills, foot-in-the-door, and sustaining environments theories—provide compelling explanations for these enduring effects of self-affirmation.

Conclusion

A growing number of experimental field studies in secondary and postsecondary settings has revealed the potential for a variety of relatively brief, but well-conceptualized social-psychological interventions to improve students' academic success in school. These interventions help students more effectively navigate individually and socially constructed beliefs that affect school outcomes and that can, in turn, have important impacts on their short- and longer-term educational outcomes (Walton & Wilson, 2018). Yeager and Walton (2011) have noted that these social-psychological interventions can seem "magical" because the substantial academic impacts they often produce do not align with the perceived simplicity and brevity of the interventions. Yet, building on theories advanced by Dweck (2006), researchers have helped students adopt a "growth mindset" that intelligence is not fixed and that effort and new approaches to learning can help fuel success in school (Yeager et al., 2019). Other interventions have leveraged motivation theory to help students make stronger connections between schoolwork and their lives, thus highlighting the "utility value" of course material (Harackiewicz, Canning, Tibbetts, Priniski, & Hyde, 2016; Hulleman & Harackiewicz, 2009). In addition to these examples, this longitudinal study of the impacts of self-affirmation provides evidence of its enduring and potentially life-changing academic impacts for students of color.

Given the strong and sustained effects of this intervention, it seems very worthy of replication across other schools and contexts to determine if it can make a difference at an even larger scale. Nevertheless, as Borman (2017) recently noted, there are also key questions that remain regarding for whom, under what conditions, and through which specific mechanisms self-affirmation produces its intended benefits for students experiencing social identity threats within the academic domain.

Self-affirmation interventions tend to have positive effects only for racially stigmatized students suffering from stereotype threat (Steele & Aronson, 1995) and in those contexts in which there is a "threat in the air" (Steele, 1997). This suggests that only those students who experience a combination of specific individual characteristics and school contextual circumstances will benefit. We did not directly observe the extent to which racial/ethnic minority students in our sample experienced stereotype threat and we use racial/ethnic classifications as simple proxies for students who are suffering from the threat. We do not believe that all students who could experience stereotype threat in fact do always experience it. The students we identify as being "potentially" subject to stereotype threat—and therefore potentially benefitting from self-affirmation—are likely to vary substantially in their susceptibility to stereotype threat and their responses to the self-affirmation treatment. Our study evaluates only the extent to which self-affirmation benefits, on average, a sample of students who are potentially suffering from stereotype threat and evaluates whether they benefit from being assigned self-affirmation writing exercises in school. Our results, therefore, are likely to offer a conservative estimate of the impact of self-affirmation on students who are subject to stereotype threat because the larger effects of self-affirmation on threatened students may be diluted by the smaller or null effects on students experiencing less or no identity threats.

Further, in field-based studies across multiple schools there may be school contextual differences that can moderate the threats in the air and, in turn, the potential benefits of affirmation. Prior research has shown that when potentially threatened students experience school settings having the strongest hallmarks of a stereotype-inducing environment—schools in which racially stigmatized students are relatively small in number and in which achievement disparities are especially large—impacts of the intervention are strongest (Borman et al., 2018). Interestingly, the threat contexts across the four high schools in our sample were relatively uniform, especially in comparison to the middle-school contexts in which the exercises were originally fielded. Specifically, as described in our Method section, the achievement gaps separating potentially threatened students from their white and Asian peers became more consistent, and uniformly large, across the district's four high schools as compared to the middle schools in which students received the intervention in seventh grade. Relative to the middle schools, the high school contexts also far more consistently placed potentially threatened students in the numerical minority, ranging from 29% to 41% of the high schools' total student enrollments. Both factors, thus, exposed potentially threatened students to more uniform and more threatening contexts, because all school contexts in our sample were characterized by consistently large achievement disparities and smaller representations of students of color.

Other school contextual features likely exacerbated the threats in the air and, thus, the potential for students to experience continued benefits from affirmation. In general, the long-term implications of school performance for future educational and occupational attainment increase as students progress through middle and high school (Eccles & Harold, 1993). This universal experience across all high schools may be another factor that increased the threats felt by students within our sample. Finally, as our findings suggest, potentially threatened students experienced greater declines in GPA and successfully completed high school at lower rates than their white and Asian counterparts. Witnessing more and more students of color across the district experiencing these academic difficulties may produce additional threat-inducing cues for potentially threatened students that may help explain the powerful and enduring impacts we observed.

We as researchers can "prescribe" an affirmation intervention, but we certainly cannot force all students to reliably engage in the affirming writing and reflection that is theorized to produce its buffering effects. Variation in students' levels of engagement with the self-affirming writing that is prompted by the intervention can, understandably, mediate the impacts of the intervention (Borman et al., 2018). Nevertheless, prior field research and systematic coding of students' responses by these authors suggests that self-affirmation is a relatively reliable treatment. More than three of four potentially threatened students consistently engage in the prescribed self-affirming writing over the course of just two of the four intervention exercises and over 90% of students complete the exercises assigned to them. When researchers attempt to translate psychological theory and well-designed laboratory interventions to field-based implementa-

tions, the impacts found in the classroom are often diluted due to a lack of treatment fidelity, which has been more strongly associated with variability in teachers' implementation quality than variability in student engagement (Hulleman & Cordray, 2009). The self-affirmation intervention is fundamentally a self-administered, student-centered intervention and it does not depend on teacher implementation quality to the same extent as many other psychological and educational interventions. In addition, prior work on self-affirmation reveals that the intervention operates by helping students protectively self-identify in the face of future threats. Indeed, the recent work by Brady et al. (2016) highlights mechanisms of affirmation that may grow and become spontaneously enacted during the years following intervention. These characteristics of affirmation suggest that it can be administered with strong fidelity and that it can encourage recursive effects and other mechanisms that help sustain the intervention's impacts over time for potentially threatened students.

Finally, the specific mechanisms through which self-affirmation produces benefits, such as those found here, require greater attention in the future. The field has only limited evidence of social or psychological mediators of intervention effects. For instance, Shnabel, Purdie-Vaughns, Cook, Garcia, and Cohen (2013) reported that the academic impacts of self-affirmation on potentially threatened African American and Latino students are explained by their increased sense of social belonging. A second mechanism is suggested by the work of Critcher and Dunning (2015), which indicates an "affirmation as perspective" model, in which self-affirmations "expand the contents of the working concept—thus narrowing the scope of any threat" (p. 4). In a similar vein, self-affirmation may broaden the perspective through which students view salient threats (Cohen & Sherman, 2014). Potentially threatened students often construe negative events in narrow concrete terms. When affirmed, though, students report higher levels of construal and report less adversity in school related to identity threats than do control students (Sherman et al., 2013). To date, though, no large-scale field trials have produced such evidence regarding *how* self-affirmation produces its impacts on students' academic outcomes.

Future research should continue to examine these issues of moderation and, potentially, assess how changes in school context across the transition from middle to high school might influence potentially threatened students' individual experiences of threat. Mediating mechanisms, such as students' varying levels of engagement with the writing exercises also deserve additional attention. Finally, gathering data on other potential social-psychological explanations of how affirmation works by, for instance, increasing students' sense of social belonging, promoting higher levels of construal, or decreasing stereotype-threat activation, would help further advance our understandings of self-affirmation.

Social-psychological theory is well-positioned within education research. It can help expose and address issues, such as stereotypes and biases, which are far less tangible with far fewer prescribed policies or practices relative to matters of curriculum, instruction, and school organization. Only recently have states begun to recognize and adopt, alongside their long-standing academic learning standards, comprehensive, free-standing learning goals for socioemotional learning, with K–12 developmental benchmarks. The important "real-world" academic benefits found in the current study highlight the practical importance of this particular intervention for buffering racial/ethnic minority students from social-identity threats. These results also call attention to addressing the social-psychological needs of middle-school students more generally. Given the significant personal, social, and economic consequences of school noncompletion, greater attention should be directed toward preventing the process of disengagement, which often takes root at the start of middle school and corresponds with the timing of this intervention. Declining grades in middle school are among the most important early warning signs, which more often than not predict students' dropping out of high school (Balfanz, Herzog, & Mac Iver, 2007). To help stem this decline, future scaling by researchers of affirmation theory should advance additional questions of for whom, under what circumstances, and how threatened students can more productively engage in academics and stay on track toward high school graduation, buffered from the harm of societal and school-based stereotypes.

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