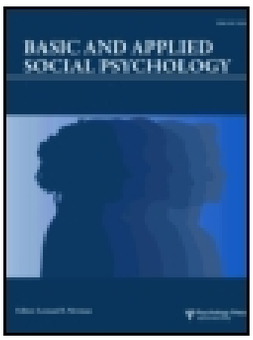

Basic and Applied Social Psychology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/hbas20

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To cite this article: Caitlin Brez , Eric M. Hampton , Linda Behrendt , Liz Brown & Josh Powers (2020): Failure to Replicate: Testing a Growth Mindset Intervention for College Student Success, Basic and Applied Social Psychology, DOI: 10.1080/01973533.2020.1806845

To link to this article: https://doi.org/10.1080/01973533.2020.1806845

Published online: 12 Aug 2020.

BASIC AND APPLIED SOCIAL PSYCHOLOGY
https://doi.org/10.1080/01973533.2020.1806845

Failure to Replicate: Testing a Growth Mindset Intervention for College Student Success

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ABSTRACT

Interventions surrounding mindset have recently been applied as a tool for student success in higher education. The current study tested the efficacy of a growth mindset intervention at a university with a diverse student population. Using gateway math and introductory psychology courses, students were randomly assigned to receive a mindset message or one endorsing study skills. Dependent variables were course grade, term GPA, term credit hours earned, and retention to subsequent terms. Analyses using the full sample, minority sample, Pell-eligible, and first-generation college students did not yield meaningful differences in students' academic success between the intervention and control groups. Further research should investigate why mindset intervention has proven successful with other populations not represented in the present study.

As educators, one of our primary concerns is student success. Higher education is increasing its focus on this by creating offices and administrators who design and deploy programs and activities to improve student retention and graduation rates. At its core, these changes are intended to help students navigate the college experience, find resources and strategies to help them in their courses, and support student learning. As part of this effort, institutions of higher education are seeking cost-effective resources and interventions that impact their students' success. Recently, one direction that these interventions have taken has focused on the growth mindset theory (Dweck, 2006).

In 2006, Carol Dweck published her popular book *Mindset,* which outlines the theory and describes how people's beliefs about themselves can influence them in a variety of domains such as business, relationships, and academics. She describes two types of mindsets: a *growth* mindset and a *fixed* mindset. With the growth mindset (also called "incremental theory"), individuals realize that their talents and abilities are subject to change, specifically growth and improvement, as a result of effort and learning. From this perspective, a person is not born smart or athletic or artistic, but rather through practice, hard work, and effort, can develop these abilities. In contrast, the fixed mindset (also called "entity theory") is the belief that our talents and abilities are inborn and static. While some people have often conceptualized these as two categories of thinking, more recently researchers have conceptualized these as opposite ends of a spectrum and suggest that one can either possess aspects of both or lean toward one pole or the other depending on the situation (Dweck, 2015).

Beyond the value of understanding people's motivation, this theory has stimulated research demonstrating that different mindsets can lead to different outcomes and having a growth mindset can improve learning outcomes. When children are praised for their effort and the process of learning, children will seek out more learning goals (i.e., they want more challenging work as it will be an opportunity to learn), have higher task performance, show greater persistence on work, and will rate tasks as more enjoyable (Mueller & Dweck, 1998). Additionally, researchers have found similar results in middle school math students (Blackwell et al., 2007). These findings suggest that mindsets can influence other internal belief states such as motivation and goals, but can also influence behaviors as well.

Mindset intervention research

If mindsets can influence behavior, then it seems logical that this is one potential source of intervention.

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In fact, researchers have spent over 10 years investigating this question (Paunesku et al., 2015). In one of the first studies of this kind, Dweck and colleagues created an 8-week intervention in which they taught middle school math students about the brain, its malleability, and the potential to improve skills through neural changes (Blackwell et al., 2007). The control group did similar activities but never learned about the growth mindset material. They found that the students in the intervention group (i.e., growth mindset) showed a positive change in motivation and their math grades improved. As noted earlier, these positive findings from the intervention have led researchers to apply this intervention to diverse populations and outcomes such as adolescents with mental health problems (Miu & Yeager, 2015; Schleider & Weisz, 2018), adolescents working on personal development through an outdoor adventure course (O'Brien & Lomas, 2017) and parents trying to improve their children's reading and writing scores (Anderson & Nielson, 2016). However, the majority of these interventions (also known as "lay theory interventions," "social psychological interventions," or "implicit theories of intelligence interventions") have been targeted at students in academic settings focused on promoting academic outcomes such as grades (see Yeager & Walton, 2011 for a review of these studies).

While this work originated in K-12 education, researchers have begun to appreciate the potential that these interventions may have for higher education. Growth mindset interventions have been effective at improving students' grades and/or GPA (Aronson et al., 2002; Yeager, Walton, et al., 2016), increasing student retention (Yeager, Walton, et al., 2016), and enjoyment and/or engagement in academics (Aronson et al., 2002). Furthermore, these effects are most pronounced for students from disadvantaged backgrounds such as racial minorities and persons from low-income backgrounds (Aronson et al., 2002; Good et al., 2003; Rattan et al., 2015; Spitzer & Aronson, 2015; Yeager et al., 2014; Yeager, Romero, et al., 2016; Yeager, Walton, et al., 2016). Another important finding from this body of work is that these interventions also are particularly relevant at periods of transitions such as from high school to college (Yeager, Walton, et al., 2016). However, this research has not been conducted at an institution similar to the one for the present study, which has comparatively larger numbers of racial minorities, low-income students, and first-generation students, as well as a lower level of admission selectivity. As some of the research suggests, this is the population that may perhaps receive the greatest benefit from these types of interventions (Aronson et al., 2002; Good et al., 2003; Rattan et al., 2015; Spitzer & Aronson, 2015; Yeager et al., 2014; Yeager, Romero, et al., 2016; Yeager, Walton, et al., 2016), yet this population remains understudied especially in higher education.

Despite the positive evidence for these interventions, research is beginning to surface which questions the value of these interventions. Several studies have failed to find positive effects for growth mindset interventions (Burnette et al., 2018; Dixson et al., 2017; Schmidt et al., 2017) or the effects have been short-lived (Orosz et al., 2017). Sisk et al. (2018) published a meta-analysis highlighting the lack of effects. In their first set of analyses, the authors looked at the relationship between individuals' mindsets and academic achievement. In this set of studies, there were no interventions, but rather the intent was to study the relationship between individuals' preexisting mindsets and academic outcomes. Of the 129 studies that they analyzed, only 37% found a positive relationship between mindset and academic outcomes. Furthermore, 58% of the studies found no relationship and 6% found a negative relationship between mindset and academic outcomes (Sisk et al., 2018). The authors noted that this relationship may be stronger for children and adolescents, but does not seem to hold as well for adults. In the second set of analyses, the authors looked at the relationship between growth mindset interventions and academic outcomes. They found 29 studies of this type, and of these, only 12% had a positive effect, meaning that the growth mindset intervention improved academic achievement. In fact, 86% of the studies found no effect of the intervention and 2% found a negative effect of the intervention (Sisk et al., 2018). Consistent with earlier published studies, the authors found that the interventions seemed to work for low SES populations, but not higher SES populations.

Focus of study

The study reported here tested a growth mindset intervention at a Midwestern, regional university. Many of the growth mindset interventions being conducted at institutions of higher education were conducted at either Ivy League schools or community colleges. Our student population does not match the demographics of the former with respect to our comparatively larger numbers of racial minorities, low-income students, and first-generation students, as well as our lower level of admission selectivity. For this

reason, we believe our students represent a population that has not been addressed by growth mindset interventions and one that may benefit the most from this type of intervention as supported by previous research (Aronson et al., 2002; Good et al., 2003; Rattan et al., 2015; Sisk et al., 2018; Spitzer & Aronson, 2015; Yeager et al., 2014; Yeager, Romero, et al., 2016; Yeager, Walton, et al., 2016). Through this randomized control trial, we tested the effectiveness of a growth mindset intervention to improve students' course grades and GPA.

Materials and methods

Participants

The population for this project included students enrolled in gateway math and psychology courses. These courses were selected as they have particularly high drop/fail/withdrawal (DFW) rates on this campus. As these are courses where students typically struggle, the goal was to target these students for the intervention to maximally impact their performance in the course and their long-term success. These courses were examined at three levels for math, remedial (MATH 035; Fundamentals of Algebra II), non-STEM (MATH 102; Quantitative Literacy), and STEM and select other majors (MATH 115; College Algebra), and within psychology, (PSY 101; General Psychology). Such courses are routinely taught at colleges and universities throughout the country. At the focal institution for this study, approximately 18% of all students enrolled in MATH 035 received a D, an F, or dropped the course annually. With regard to MATH 102, 24% of all students enrolled received a D, an F, or dropped the course annually. For MATH 115, 40% of enrolled students received a D, an F, or dropped the course annually. Finally, 28% of enrolled students received a D, an F, or dropped PSY 101 annually.

The sample for the study consisted of 2,135 undergraduate students enrolled in the three levels of math across three academic terms, Spring 2015, Fall 2015, and Spring 2016 as well as 733 undergraduate students enrolled in Psychology 101 across two academic terms, Fall 2016 and Spring 2017. The total number of students in these courses during this time period was 4465, and of those, 2,607 (58.4%) participated in this study. The students were majority freshmen and demographically diverse in areas of critical student mass on the campus, namely approximately 54% were White, 42% were African American, and 48% were low income (supported by a Pell grant). Approximately 28% were the first generation, defined as neither parent having a college degree. Approximately, 50.2% of the sample were female (based on the data for which gender was known).

Response rates to the online activity and survey were not recorded. Students could leave the survey at any time and take as little or much time to complete the intervention/activity as desired. The data presented here represent participants who at least started the online activity. However, students could only participate in the online intervention/activity one time. For example, if they took the online intervention in their math class and then enrolled in psychology during a later semester, they would receive a prompt informing them that they had already participated. Likewise, if they failed a class or retook a class, their data would only be included in the analyses once. In terms of the larger context of this intervention, we continued to collect data on course grades, GPA, and retention throughout the duration of the study period, and no one was excluded once they were assigned to either the treatment or control condition.

Measures

Dependent measures

Our dependent measures are typical outcome measures reported for these types of intervention studies and included course grade, term GPA, and term credit hours earned. These variables were measured on a continuous scale. Letter grades for the course were transformed into GPA units (A = 4.0; A− = 3.7; B+ = 3.3; B = 3.0; B− = 2.7; C+ = 2.3; C = 2.0; D+ = 1.7; D = 1.0; D− = 0.7; F = 0.0) for analysis. The term GPA was for the term of the intervention experiment. Following the intervention, these measures were collected at the end of the intervention term and once at the end of each semester following.

Design and procedures

The study design was a randomized, controlled trial such that students were randomly assigned at the beginning to either the treatment or control condition. All eligible students were randomly assigned to each condition, and then once students were invited to participate, they would be directed to the correct online survey (either treatment or control). Prior to inviting students, the section instructors' willingness to participate in the study was secured. Students were asked to log into a website in which they were randomly assigned to a treatment or control condition. Using an

online survey platform, treatment condition students were provided instructions asking them to read an article about how the brain can grow stronger through effort and how difficult subjects such as math (psychology in the case of those students) can be mastered as a result, and that anyone can learn math (or psychology). The article was similar in content to previous mindset interventions (e.g., Blackwell et al., 2007) and was a little over one page in length. It provided scientific evidence that the brain changes as a result of learning. It also described how math (or psychology) practice could lead to an improvement in skills and why making mistakes help us learn more. They were then invited to identify the main point of the article from a list of three selection options. We did not exclude any participants based on their responses to this question because we provided the correct answer to ensure appropriate interpretation. From there, they were asked to write a letter to a future student describing how they could learn math (or psychology) and that these letters would be shared with future students. This exercise was designed to help participants reflect on the content of the article and hopefully increase the retention of the main concepts. There was no incentive for participants to complete this exercise, but in both math and psychology courses, the content was embedded within the course structure—for math, it was conducted within the classroom and for psychology, it was listed as an assignment for students to complete.

The control condition students followed a similar procedure, although in this case, they read a general article about math (or psychology), offering basic guidance on seeking help such as through tutoring. There was no mention of growth mindset or concepts related to this theory in the control condition. The control condition was designed to be as similar to the treatment condition (e.g., reading length, questions asked, reflection activity) without the mention of a growth mindset.

Additionally, a team of external evaluators monitored the project for adherence to scientific best practices that met the What Works Clearinghouse standards for research (U.S. Department of Education, n.d.).

Results

As shown in Table 1, we calculated descriptive statistics for our dependent measures (final grade for the course, term GPA, and the number of earned hours for the semester) for the entire sample as well as by condition (treatment vs. control). As can be seen from these data, there are little differences across conditions for all three outcome variables. Standardized differences are presented as positive values when in agreement with the theory (treatment greater than control) and negative values when contrary to the theory (control greater than treatment). Standardized differences across treatment conditions were very small for all outcomes (final grade $d = -0.01$; term GPA $d = -0.02$; earned hours $d = -0.02$). There is a minimal effect of a growth mindset message on improving these outcomes.

Table 1. Descriptive statistics for dependent measures for the full sample as well as for each condition.

Outcome	*n*	Mean	SD	Skewness	Kurtosis
Full sample	2,607				
Final grade	2,639	2.39	1.39	−0.54	−0.97
Term GPA	2,821	2.71	0.88	−0.85	0.24
Term earned hours	2,865	12.88	16.08	−1.35	2.31
Treatment condition	1,314				
Final grade	1,203	2.40	1.48	−0.53	−1.04
Term GPA	1,292	2.72	0.95	−0.85	0.22
Term Earned hours	1,311	12.89	4.00	−1.28	2.74
Control condition	1,293				
Final grade	1,203	2.42	1.37	−0.59	−0.87
Term GPA	1,275	2.74	0.93	−0.89	0.35
Term earned hours	1,293	12.96	3.95	−1.42	2.63

Table 2. Descriptive statistics for dependent measures for minority students.

Outcome	*n*	Mean	SD	Skewness	Kurtosis
Treatment condition	457				
Final grade	417	2.02	1.48	−0.16	−1.39
Term GPA	454	2.50	0.90	−0.56	−0.15
Term earned hours	457	12.49	3.71	−1.08	1.39
Control condition	501				
Final grade	463	2.16	1.41	−0.34	−1.17
Term GPA	492	2.57	0.94	−0.72	0.20
Term earned hours	500	12.51	4.04	−1.33	1.82

Minority student analyses

Given previous literature noting the particular benefits for students from disadvantaged or marginalized backgrounds, course grade ($n = 846$), term GPA ($n = 892$), and term earned credit hours ($n = 920$) were compared across treatment and control conditions for just the sub-sample of minority students, defined as students identifying as any ethnicity other than White. These data are provided in Table 2. As in the full sample, the differences between the treatment and control conditions are slight and, if anything, favor the control condition. Standardized differences across treatment conditions were small to very small for all outcomes (final grade $d = -0.10$; term GPA $d = -0.08$; earned hours $d = -0.01$). There is little

Table 3. Descriptive statistics for dependent measures for Pell eligible students.

Outcome	*n*	Mean	SD	Skewness	Kurtosis
Treatment condition	650				
Final grade	593	2.23	1.44	−0.39	−1.22
Term GPA	634	2.59	0.93	−0.66	−0.11
Term earned hours	648	12.71	4.04	−1.40	1.86
Control condition	643				
Final grade	592	2.23	1.36	−0.41	−1.03
Term GPA	633	2.56	0.97	−0.80	0.05
Term earned hours	642	12.68	4.14	−1.50	1.86

Table 4. Descriptive statistics for dependent measures for first-generation students.

Outcome	*n*	Mean	SD	Skewness	Kurtosis
Treatment condition	345				
Final grade	315	2.45	1.46	−0.57	−1.06
Term GPA	338	2.75	0.96	−0.82	0.03
Term earned hours	344	12.98	3.86	−1.51	2.37
Control condition	349				
Final grade	317	2.30	1.31	−0.52	−0.85
Term GPA	344	2.64	0.91	−0.85	0.32
Term earned hours	349	12.71	3.91	−1.34	2.35

evidence of any benefit of the growth mindset intervention for minority students.

Pell-eligible student analyses

Course grade ($n = 1{,}151$), term GPA ($n = 1{,}201$), and term earned credit hours ($n = 1{,}249$) were compared across treatment and control conditions for Pell-eligible students, the second category of disadvantaged or marginalized student. These data are presented in Table 3. Standardized differences across treatment conditions were very small or non-existent for all outcomes (final grade $d = 0$; term GPA $d = +0.03$; earned hours $d = +0.01$). There are little or no differences between the treatment and control groups on these outcome variables for Pell-eligible students.

First-generation college student analyses

The final analysis involved a third student category, first-generation students, who the literature also notes as often historically marginalized or disadvantaged in higher education. These data are presented in Table 4. Standardized differences across treatment conditions were small for all outcomes (final grade $d = +0.11$; term GPA $d = +0.12$; earned hours $d = +0.07$). As with previous analyses, there is little difference for these outcome variables between the treatment and control conditions, in this case for first-generation students.

Discussion

This study tested the effectiveness of a growth mindset intervention on students' academic success (measured by course grades, term GPA, and earned credit hours) for students at a Midwestern, regional university. The pattern of findings is clear that the intervention had little impact on students' academic success even among sub-samples of students who are traditionally assumed to benefit from this type of intervention (e.g., minority, low income, and first-generation students).

These findings support some of the emerging literature that demonstrates that growth mindset interventions may not be as effective as once thought (Burnette et al., 2018; Dixson et al., 2017; Sisk et al., 2018; Schmidt et al., 2017). While the growth mindset has been used in K-12 schools for many years, its application in the realm of higher education is more recent. The proposition that a one-time intervention at the postsecondary level will result in long-term measurable student outcomes was not supported in the present study. Despite the student body make-up thought to be most likely to benefit from an intervention (e.g., first-time college, low income, racially minority), the outcomes of the interventions were not evident across these populations.

The findings from the present study provide additional evidence to support questioning the effect of growth mindset in student success and retention efforts in higher education, at least in a one-time intervention form that some literature suggests is sufficient. The research design followed protocols used in earlier mindset intervention research; however, the student population involved in the present study had not been addressed in the previous studies. Additionally, we included first-time college students, a time of transition when interventions are purported to be especially applicable (Yeager, Walton, et al., 2016). Despite previous findings showing the effectiveness of a one-time intervention for this transition time (Yeager & Walton, 2011), our data did not support this conclusion.

Perhaps the lack of support for this intervention is due to a limitation in our sample. Approximately 41% of the students invited to participate in the intervention chose not to or were prevented from participating a second time. While the sample that did participate generally matched the demographics of the entire study body, it is possible that the group that chose not to participate differed significantly in a meaningful way that could be masking or eliminating any possible effect of the intervention. Despite this, we used a randomized controlled trial to minimize

bias across the two groups. Our study was evaluated by a team of external evaluators who relied on the What Works Clearinghouse (WWC) standards for research, which maintains the highest standards for education intervention research (U.S. Department of Education, n.d.).

Additionally, the intervention was conducted in two different disciplines—math, in which placement is made by demonstrated ability; and psychology, which is open to students of all abilities without prerequisite demonstration of competence. The first three interventions were completed with students enrolled in a math class, a discipline that previous studies had examined. Not only was math chosen for this study because it was a domain that has been addressed previously through mindset interventions (Blackwell et al., 2007), but math is a field where fixed mindsets seem to be rampant (e.g., "I'm just not a math person"). Thus, it seems like this would be a field where there is great potential to change mindsets. Yet, these cohorts evidenced little difference between the treatment and control groups. One concern was that math is also a field in which students have had years of experience in which this growth mindset (or fixed mindset) can build. Most students have been taking math since they first started schooling. It might be a real challenge to alter over 12 years of experience in this field, in which students' mindsets have been built and reinforced over the years. Therefore, the researchers decided to try the intervention in a different discipline without this same educational history—psychology. However, once again little effect of the intervention was found in psychology. The difference in discipline did not generate meaningful differences in any of the variables (e.g., Pell, minority, first-time college). Thus, it appears that even in a discipline where the opportunity to cement a fixed mindset is less or where the potential to introduce a growth mindset is greater, the intervention was still not effective in changing the student success outcomes that were measured.

Spitzer and Aronson (2015) asserted that factors beyond belief about how intelligence affects academic success are also important to student success, and may provide the untested explanation for no differences between groups. Some examples include exogenous factors that are not captured by a simple measure of race/ethnicity, first-generation status, or a cut category on income (i.e., Pell or not). Furthermore, the proximity of the campus to home may also be a relevant unmeasured factor as might the ease of transferability, a consideration relevant to the term retention finding. There is also a rich literature on the topic of toxic stress (Shern et al., 2016), a phenomenon these researchers know is common at the focal institution, and might also be difficult or impossible to overcome from a simple psychological intervention. Related to this point, some scholars report the importance of satisfying individuals' basic needs (e.g., Maslow's hierarchy of needs) prior to focusing on academic motivations and goals (Rich, 2011 and Burdenski & Faulkner, 2010). Particularly for students of low socioeconomic status (SES), priorities often focus on dealing with nonacademic needs and stress first. Thus, an intervention focused on growth mindset might not be motivating enough or might not focus on the fundamental needs at the moment for these students. Given that our student population experiences financial stress, toxic stress, food insecurity, and other concerns related to their low SES, this may be a possible explanation for the lack of findings in the current study.

Alternatively, it is possible, as suggested by our data and others' data (Sisk et al., 2018) that these types of growth mindset interventions are not as effective as originally claimed. Perhaps the message or intervention is too simple; student success is a complicated topic and many factors, motivations, and behaviors may all play a role in these outcome variables (Karlen et al., 2019). As noted above, many factors can influence students' perceptions, experience with the transition to college, and their ability to successfully navigate this environment (i.e., fear of failure; Bartels & Ryan, 2013). It is possible that a one-time intervention cannot overcome over 18 years of education and experience that may fuel some of the perceptions and motivations that this intervention is trying to overcome. Perhaps these interventions may be better for younger ages, although research is not supporting that claim (Li & Bates, 2019; Sisk et al., 2018). Another possibility is that these interventions are not changing people's mindsets. While we are measuring effects on large-scale academic outcomes, the underlying assumption is that these interventions are affecting individuals' mindsets (i.e., encouraging more growth mindset thinking; Bahnik & Vranka, 2017). Related to this point, it is possible that a large number or even the majority of individuals start high on the growth mindset, thus limiting the effectiveness of a short-term intervention. Two ways to address this issue would be to better understand our current measurements of mindset and to develop alternate measurements of this construct. Furthermore, perhaps methodological differences that may be difficult to

capture in writing may exist and account for some of the differences between the current study and previous studies that have found a positive effect on growth mindset interventions. Differences in data analysis procedures could reflect differences in the reporting of the outcomes. In the present study, we relied heavily on our randomized controlled design to allow us to make simple comparisons across the two conditions. In our analysis comparing the two conditions, there was a negligible effect of the intervention on student outcomes.

If these growth mindset interventions are not as effective as claimed, then this necessitates a reevaluation of Dweck's growth mindset theory. Several possibilities exist here. At one extreme is the possibility that people do not have these different types of mindsets (fixed or growth). These may be manifestations of other aspects of our psychological experience such as other motivations, like approach or avoidance (Bartels & Ryan, 2013). Research exists that demonstrates how our motivations can be shaped by fear of failure, self-efficacy, grit, and locus of control and how these motivations can affect academic performance (Burdenski & Faulkner, 2010; Buzzetto-Hollywood et al., 2019; Ciani et al., 2011; De Castella et al., 2013; Kannangara et al., 2018; Karlen et al., 2019). If we do not have these mindsets as proposed, these alternative psychological theories could explain some of the behavioral and psychological effects that are attributed to mindsets. Alternatively, if we do not have these mindsets, then this could explain why research is failing to support the value of these interventions. Finally, these alternative psychological theories could better explain how our motivations could affect academic outcomes.

Another, and more plausible, possibility to reevaluate mindset theory is that the presence of differing mindsets (fixed and growth) are valid, but that the ability to use, manipulate or alter these mindsets to the benefit of others is not possible. To use a fixed mindset argument, these mindsets may be more like personality traits that are not as malleable as Dweck suggests. Mindsets might be harder to change and alter than previously thought (Li & Bates, 2019). One of the attractions of the mindset interventions is that they are relatively easy—quick, inexpensive, easily administered. Many educators were likely attracted to the feasibility of implementing these interventions at such a low investment. However, this might be a situation in which the intervention was "too good to be true." If mindsets are not as malleable as suggested, then this simple, one-time intervention might not be enough dosage or enough power to alter or manipulate mindsets. For our population, again, these students had approximately 18 years of lived experience that likely contributed to and shaped their mindsets regarding their academic ability. A brief intervention might not be enough to overcome that experience.

The implications of this research are several. First, research should continue in this field to better understand the mindset theory and these types of interventions. Our data, along with others, suggest that mindset interventions are not effective in improving academic outcomes, at least course grade, term GPA, and earned credit hours. A second implication is that schools and universities may want to consider withdrawing any interventions of this kind or stop pursuing any future interventions until we know more. These interventions do not appear to be doing harm, but any investment of time, energy, and money may not be worthwhile. A third implication of these data is that mindset theory may need reevaluation. More thoughtful review and evaluation of the theory can help us to better understand its merits and weaknesses and its relevance to empirically support the psychological theory. We certainly hope that research will continue in this field to help better understand both the theory and its practical implications for human behavior.

In conclusion, the lack of differences across all of the measures calls into question the utility of brief, one-time interventions focused on growth mindset, at least for the kinds of students found at a regional university. It is possible that these types of interventions may be more effective for other types of student populations and institutional settings, but further research is needed. Future studies should also explore why the intervention has been shown to be effective with K-12 students but produces mixed results with college students. It is possible that these types of interventions, when combined with other psychological messaging, such as belongingness (Walton & Cohen, 2011; Walton et al., 2015) or self-control (Duckworth & Seligman, 2005; Tangney et al., 2004), or grit (Duckworth, 2016), maybe more effective. Another possible direction for future research is to identify different measures of student success, such as achievement scores or students' subjective experience rather than grades and GPA. Finally, it may be that multiple psychological intervention "doses" might be needed to realize an effect. Nevertheless, the present study calls into question the universal use of growth mindset interventions across sectors of higher education, despite its practical and cost-effective appeal. And, given

the importance of the regional state university for educating the largest numbers of historically underserved students in the 4-year sector in the United States, it is important that research continues to attempt to identify ways to help them remain in school and graduate.

Acknowledgment

We appreciate Linda Ferguson's generous support with gathering institutional data for this project.

Funding

This study was supported by a First in the World Grant through the Department of Education.

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