

Mindsets That Promote Resilience: When Students Believe That Personal Characteristics Can Be Developed

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Because challenges are ubiquitous, resilience is essential for success in school and in life. In this article we review research demonstrating the impact of students' mindsets on their resilience in the face of academic and social challenges. We show that students who believe (or are taught) that intellectual abilities are qualities that can be developed (as opposed to qualities that are fixed) tend to show higher achievement across challenging school transitions and greater course completion rates in challenging math courses. New research also shows that believing (or being taught) that social attributes can be developed can lower adolescents' aggression and stress in response to peer victimization or exclusion, and result in enhanced school performance. We conclude by discussing why psychological interventions that change students' mindsets are effective and what educators can do to foster these mindsets and create resilience in educational settings.

When students struggle with their schoolwork, what determines whether they give up or embrace the obstacle and work to overcome it? And when students feel excluded or victimized by peers, what determines whether they seek revenge through aggression or seek more productive solutions? Resilience—or whether students respond positively to challenges—is crucial for success in school and in life. Yet what causes it? And what can be done to increase it?

In this article we demonstrate the impact of students' mindsets—or *implicit theories* about the malleability of human characteristics—on their academic and social resilience (Dweck, 2006; Dweck, Chiu, & Hong, 1995). We show how mindsets can contribute to two of the most important issues currently facing educators: (a) *academic underachievement* and (b) the impact of *peer exclusion and victimization*. Each of these problems is of great concern, yet each has been frustratingly difficult to address. For example, many of the large-scale interventions evaluated by the Institute of

Education Sciences in recent years have failed to produce significant gains in achievement beyond the treatment period (e.g., Garet et al., 2010; Glazerman et al., 2010; James-Burdumy et al., 2010; Somers et al., 2010). Similarly, although whole-school antibullying interventions consistently reduce aggression among elementary school students, among adolescents even large, well-implemented interventions frequently have no effect (Karna et al., 2011; Silvia et al., 2011). Those programs may have taught important skills or provided key resources. Yet we show that attention must also be paid to the psychology underlying adolescents' resilient responses to academic and social challenges.

Prominent in this underlying psychology are students' implicit theories (Dweck, 2006; Dweck et al., 1995). For example, our research shows how the theory that intelligence is fixed and unchangeable can lead students to interpret academic challenges as a sign that they may lack intelligence—that they may be “dumb” or might be seen as “dumb.” As we demonstrate, this way of thinking compromises resilience in academic settings, even among high-achieving students (Blackwell, Trzesniewski, & Dweck, 2007; Hong, Chiu, Dweck, Lin, & Wan, 1999; Nussbaum

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& Dweck, 2008). In the same way, an implicit theory that personality is unchangeable can lead adolescents to interpret peer victimization or exclusion as something that cannot change (Yeager, Trzesniewski, Tirri, Nokelainen, & Dweck, 2011). It is clear how this can reduce resilience. In each case, even when adolescents are taught the intellectual or social skills they need to be resilient, they may not employ them adequately unless their mindsets foster the idea that their academic and social adversities have the potential to improve (Blackwell et al., 2007; Yeager, Trzesniewski, & Dweck, in press).

Our research also shows that students' mindsets can be changed and that doing so can promote resilience. Students can be taught the science underlying people's potential to change their academically and socially relevant characteristics, and they can be shown how to apply these insights to their own lives (Blackwell et al., 2007; Yeager, Trzesniewski, et al., in press). When they are, it can have striking effects on resilience. Thus, although we examine vulnerabilities, the present article also provides cause for optimism.

We summarize what implicit theories are and how they lead to resilience. We also review the effects of relatively brief and psychologically precise school-based interventions that shift adolescents' implicit theories toward a malleable view. We do so by first reviewing research on implicit theories of *intelligence* and their effects on academic performance. We then review new research on implicit theories of *personality* and their effects on aggression and stress. We also show how promoting a malleable view of personality, by reducing stress in school, can actually affect students' achievement. We end by addressing three important issues: (a) how efforts to change mindsets can increase resilience even without removing the adversities students encounter in school, (b) what parents and educators should say (or avoid saying) in order to support students' growth-oriented implicit theories in school, and (c) how implicit theories interventions should be scaled up (and how they should *not* be scaled up) to affect more students.

WHAT IS RESILIENCE?

Resilience can be defined as “good outcomes in spite of serious threats to adaptation or development” (Masten, 2001, p. 228). Within this broader definition, in the present article we call “resilient” any behavioral, attributional, or emotional response to an academic or social challenge that is positive and beneficial for development (such as seeking new strategies, putting forth greater effort, or solving conflicts peacefully), and we refer to any response to a challenge that is negative or not beneficial for development (such as helplessness, giving up, cheating, or aggressive retaliation) as not resilient. Many factors can influence a person's resilience, including the environmental risks and assets that surround them (Masten, 2001). At the same time, a premise of our research

is that it is not only the *presence* of social and academic adversity that determines a person's outcomes but also a person's *interpretations* of those adversities (Olson & Dweck, 2008; for a classic formulation in the context of depression, see Beck, 1967). As such, next we review research on the mindsets that allow a given person to show more resilient interpretations and reactions to a challenge.

WHAT ARE IMPLICIT THEORIES?

Implicit theories, in our research, are defined as core assumptions about the malleability of personal qualities (Dweck et al., 1995; Dweck & Leggett, 1988; Molden & Dweck, 2006). They are called “implicit” because they are rarely made explicit, and they are called “theories” because, like a scientific theory, they create a framework for making predictions and judging the meaning of events in one's world. Implicit theories are sometimes also called naïve or “lay” theories because, unlike scientific theories, they refer to a person's commonsense explanations for everyday events (Molden & Dweck, 2006). Although students can have implicit theories about any personal attribute, in the present article we focus on two that are especially relevant to education: implicit theories of intelligence and implicit theories of personality.

Students can vary in their implicit theories, from more of a fixed or *entity* theory of intelligence or personality to more of a malleable or *incremental* theory (Table 1). Students with more of an entity theory of intelligence see intellectual ability as something of which people have a fixed, unchangeable amount. On the other end of the spectrum, those with more of an incremental theory of intelligence see intellectual ability as something that can be grown or developed over time. In a similar way, those with more of an entity theory of personality see people's socially relevant traits as fixed, whereas those with more of an incremental theory of personality view people's traits as having the potential to change. It is important to note that implicit theories of intelligence and of personality are distinct—it is possible for a student to believe that

TABLE 1
Academic Mindsets, for Those With More of an Entity
Versus Incremental Implicit Theory of Intelligence

	<i>Entity Theory</i>	<i>Incremental Theory</i>
Goals	Look smart	Learn
Value of effort, help, and strategies?	Higher	Lower
Response to challenge	Tendency to give up	Work harder and smarter
Changes in grades during times of adversity	Decrease or remain low	Increase

intelligence can be changed but that personality cannot, or vice versa (see Dweck et al., 1995).¹

How do implicit theories work? Because a given implicit theory fosters particular judgments and reactions, it can lead to relatively consistent patterns of vulnerability or resilience over time (Dweck et al., 1995). For example, implicit theories shape people's causal attributions (Hong et al., 1999; see also Blackwell et al., 2007; Robins & Pals, 2002; for a review of research on causal attributions, see Weiner, 1986, 1995), and it is well known that explaining personal adversities in terms of fixed traits undermines resilience. As we illustrate next, these fixed-trait attributions are more likely when people have an entity theory, and they represent one pathway through which implicit theories lead to differences in resilience (e.g., Blackwell et al., 2007; Yeager et al., 2011).

IMPLICIT THEORIES OF INTELLIGENCE AND RESPONSES TO ACADEMIC ADVERSITIES

Why Do Implicit Theories of Intelligence Affect Academic Resilience?

Students' implicit theories of intelligence predict their academic performance over time, particularly when they face challenging work (Blackwell et al., 2007). We review how and why this happens.

The two implicit theories of intelligence—entity and incremental—appear to create different psychological worlds for students: one that promotes resilience and one that does not (Dweck, 2006; Dweck et al., 1995). The entity theory world is about measuring your ability, and everything (challenging tasks, effort, setbacks) measures your ability. It is a world of threats and defenses. The incremental world is about learning and growth, and everything (challenges, effort, setbacks) is seen as being helpful to learn and grow. It is a world of opportunities to improve.

More precisely, an incremental versus entity theory shapes students' *goals* (whether they are eager to learn or instead care mostly about looking smart and, perhaps even more important, not looking dumb), their *beliefs about effort* (whether effort is a key to success and growth or whether it is a signal that they lack natural talent), their *attributions* for their setbacks (whether a setback means that they need to work harder and alter their strategies or whether it means they might be "dumb"), and their *learning strategies* in the face of setbacks

(whether they work harder or whether they give up, consider cheating, and/or become defensive). Blackwell et al. (2007) showed that these are the variables that explain why students with more of an incremental theory were more resilient and earned higher grades when they confronted a challenging school transition. Crucially, this process can play out both for higher achieving and lower achieving students (Dweck & Leggett, 1988); inevitably, academic standards rise, and when they do, a person's implicit theory of intelligence can affect whether they respond resiliently.

Can Changes in Theories of Intelligence Affect Academic Behavior Over Time?

Intervention experiments have shown that, indeed, changes in theories of intelligence can affect academic behavior over time (Aronson, Fried, & Good, 2002; Blackwell et al., 2007, Study 2; Good, Aronson, & Inzlicht, 2003).

Aronson and colleagues (2002) changed college students' theories of intelligence. In the incremental theory treatment group, they first provided students with scientific information about the brain's functioning and potential malleability. Students were taught how, when learning, the brain grows stronger and smarter by forming new connections between neurons (a message that is scientifically accurate). Students were also asked to picture their brain growing a denser network of neurons when they faced academic challenges. Next, to make the message "stick," Aronson et al. asked participants to write a few "pen pal" letters teaching this message to a struggling middle school student. This treatment was compared to a control group that was taught the idea that different people have different intellectual strengths and that therefore they should not worry if they do poorly in any given area; control group students were also asked to write pen pal letters to younger students explaining this idea. There was also a second control group that was simply monitored over time. For all groups, students' grades were tracked until the end of the year. Compared to both control groups, the incremental theory group showed a significant increase in overall grade point average at the end of the year of roughly .23 grade points. The effects of learning that intelligence is improvable were slightly greater for African American students, who may face greater challenges in college than White students because of negative stereotypes about their group's intellectual ability (Steele, 1997).

Could implicit theories also increase academic resilience among seventh-grade students in the midst of a difficult adolescent transition? Good et al. (2003) examined whether middle school students who received a series of weekly mentoring e-mails over the year explaining an incremental theory would perform better on their statewide achievement tests at the end of the year. They found that, compared to students randomly assigned to a control group, students in the incremental group showed significantly higher math and verbal achievement test scores. Especially large effects were found

¹Of interest, research also shows it is possible *within* a given domain for a person to have an even more specific implicit theory. For instance, Good, Rattan, and Dweck (2012) and Rattan, Good, and Dweck (2012) examined implicit theories about math ability rather than general theories about intelligence. Beer (2002) investigated implicit theories about shyness rather than general theories about personality. An important area for future research will be to document the relative advantages for educational practice of intervening to change a more general implicit theory versus a more specific one.

among middle school girls in math—students who may need to be resilient in the face of negative stereotypes about girls' quantitative ability (Spencer, Steele, & Quinn, 1999). These girls' test scores were improved by more than 1 *SD* compared to the control group that did not learn an incremental theory of intelligence.

These studies showed that implicit theories of intelligence could be taught in school settings and that changing them could affect academic behavior. Yet they did not address whether implicit theories would have an impact relative to an intervention that provided academic skills but did not emphasize the potential for intelligence to grow and improve (e.g., the Good et al., 2003, control group taught an antidrug message). To address this issue, Blackwell and colleagues (2007, Study 2) designed two different interventions (an incremental theory intervention and a study skills intervention) and delivered each to predominately racial minority seventh-grade students. Students were randomly assigned to learn either useful study skills for eight sessions (the control group) or the incremental theory along with study skills for the eight sessions (the treatment group). Results showed that, as is common during the transition to middle school, the math grades for students in the control group continued to decline. But for students who learned the incremental theory, this downward trend was eliminated and reversed; in the months after the treatment, they showed significantly greater improvement in math grades relative to the control group, nearly returning to the levels at the beginning of the year. At year's end, this corresponded to an estimated .30 grade point difference between the two groups. Notably, the study skills taught to the control group did not reverse the decline in students' math scores; students also needed the resilience that comes from an incremental theory to put their study skills into practice.

Our more recent research has begun to use implicit theories interventions to address the extremely high failure rate of community college students who are placed in remedial or "developmental" math classes. By some estimates, nearly half of college students in America are attending a community college (Kolesnikova, 2010), and roughly 65% of them place into math classes that are precollege math—that is, math at the middle school or high school level, such as elementary algebra or even arithmetic (Center for Community College Student Success, 2011). Not surprisingly, this poses a major obstacle to their prospects for graduation. Students in many cases must pass several of these developmental courses and then college-level courses to graduate or transfer to 4-year colleges. Sadly, only a small proportion of them do so (roughly one third of those who take the classes in one analysis by Bailey, Jeong, & Cho, 2010). Placement into remediation also has the potential to lead students to conclude that math is a fixed ability that they do not possess. In fact, in one survey of such developmental math students, more than 68% endorsed an entity theory about math ability (Yeager, 2012). In light of these challenges, these students may have

an especially great need for resilience in general and for an incremental theory intervention in particular.

In this context, Paunesku, Yeager, Romero and Walton (2012) built on the Blackwell et al. (2007) intervention to create a revised reading and writing exercise that taught an incremental theory to community college students in developmental mathematics courses. It employed many of the same messages as the Blackwell et al. intervention, only these messages were tailored based on interviews and focus groups conducted with community college math students. For instance, the article that taught the incremental theory emphasized the malleability of *adults'* brains, because in focus groups some students felt that their math ability had now rigidified after a period of greater malleability in childhood. Next, although the intervention taught a general incremental theory of intelligence, it also emphasized one's potential to improve math ability so that participants could understand the specific applicability of the general theory. It said, "When people learn and practice new ways of doing algebra or statistics, it can grow their brains—even if they haven't done well in math in the past." In addition, our pilot work revealed that attempting math problems that they did not know how to solve could make students feel "dumb," and so they avoided doing challenging problems altogether and instead only worked the "example" problems (or, even worse, only read the textbook and did not work any problems at all until they felt comfortable with the content). We sought to counteract this lack of resilience when facing novel problems. Therefore the article also emphasized the importance of switching strategies and seeking out challenges in order to grow one's brain. For instance, in a section titled "A Formula for Growing Your Brain: Effort + Good Strategies + Help From Others," the article stated,

It's not just about effort. You also need to learn skills that let you use your brain in a smarter way. . . . You actually have to practice the right way . . . to get better at something. In fact, scientists have found that the brain grows more when you learn something new, and less when you practice things you already know.

Paunesku et al. (2012) evaluated the efficacy of the new intervention by delivering it via the Internet to a sample of more than 200 community college students enrolled in developmental math classes (see the Project for Education Research That Scales, <http://www.perts.net>). They randomly assigned students to read either the article that taught an incremental theory or a similar control article that taught about the brain but did not mention its potential to grow and improve with learning. As in Aronson and colleagues' (2002) research, participants in both conditions then wrote mentoring letters to future students in which they explained the key messages taught in their respective articles. Notably, teachers at the college were unaware of students' experimental condition and were not given any instruction or support

in reinforcing the treatment message. The exercise took, on average, 30 min to complete.

At the end of the semester, several months later, students' official records were obtained from their college registrar. Preliminary analyses suggest the intervention's effects were substantial. Although roughly 20% of students in the control group withdrew from their developmental math class, that number was reduced to only about 9% in the incremental theory treatment group—a significant difference (Paunesku et al., 2012). Hence, this brief incremental theory exercise increased students' resilience—it cut by more than half the withdrawal rate of developmental math students several months later, even with no explicit reinforcement from the researchers or the instructors. In addition, among those who remained in the course, treated students earned better grades and were less likely to fail. This increase in resilience is especially surprising given the nonsignificant effects on developmental course persistence found in major recent efforts to impact these students, such as learning communities (Weiss, Visher, & Wathington, 2010), conditional cash transfers (Goldrick-Rab, Harris, Benson, & Kelchen, 2011), or comprehensive college reform (Rutschow et al., 2011). We believe the implicit theories intervention had its striking effects because it changed the meaning of challenges—instead of challenges making students feel “dumb,” the challenges offered a way to get smarter. This belief was crucial for promoting resilience.

Summary

Many educational reform efforts have focused on increasing rigor in curricula and instruction, but if they do not also address resilience in the face of these more challenging standards, then making such improvements may be less effective than hoped. Our research and that of our colleagues show that if students can be redirected to see intellectual ability as something that can be developed over time with effort, good strategies, and help from others, then they are more resilient when they encounter the rigorous learning opportunities presented to them.

IMPLICIT THEORIES OF PERSONALITY AND REACTIONS TO PEER EXCLUSION AND VICTIMIZATION

Performing academically is just one of the challenges adolescents face on a daily basis. Students are also highly concerned about their social competence, in particular whether their peers include and respect them (Crosnoe, 2011; Wentzel & Wigfield, 1998). When their social relationships are challenged, for instance by peer victimization or exclusion, students need to be able to respond resiliently.

Our research, described next, shows that implicit theories of personality—or beliefs about whether people's personal-

ity traits are fixed or are malleable (Chiu, Hong, et al., 1997; Yeager et al., 2011)—can affect resilience following peer victimization or exclusion. We believed this would be especially true among adolescents in high school, for several reasons. The early years of high school are marked by an increased concern about social labels (Brown, Mory, & Kinney, 1994; Eccles & Barber, 1999) and by substantial adversities that could threaten them with negative labels. For instance, high school students at nearly every level of popularity are victimized at least somewhat by their peers (Faris & Felmler, 2011). Even when students are not directly excluded, they might still fear peer exclusion because of the instability of social networks during the transition to high school (Cairns & Cairns, 1994) and the frequent use of peer exclusion to gain social status (Cohen & Prinstein, 2006).

At the same time, adolescents increasingly seem to believe that social labels, once acquired, are fixed entities that cannot change (Birnbau, Deeb, Segall, Ben-Eliyahu, & Diesendruck, 2010; Diesendruck & haLevi, 2006; Killen, Kelly, Richardson, & Jampol, 2010). In sum, adolescents are increasingly attentive to their social labels, they are increasingly faced with the threat of negative labels, and they increasingly believe that those social labels refer to fixed traits. As a result, we expected implicit theories of personality to provide important leverage for understanding resilience in this age group.

Peer victimization and exclusion can lead to a host of negative outcomes, including aggressive retaliation (e.g., Ostrov, 2010; Reijntjes et al., 2010), greater stress (Klomek, Marrocco, Kleinman, Schonfeld, & Gould, 2007), and even academic underperformance (Crosnoe, 2011). Thus, next we focus on the role of implicit theories of personality in shaping each of these.

Aggressive Retaliation

Past research had shown that those with more of an entity theory of personality are more likely to view their own and others' negative behaviors as stemming from fixed, personal deficiencies (Chiu, Dweck, Tong, & Fu, 1997; Erdley, Cain, Loomis, Dumas-Hines, & Dweck, 1997). As a result, they tend to focus more on punishing others and less on educating or rehabilitating others (Erdley & Dweck, 1993; Gervy, Chiu, Hong, & Dweck, 1999; Loeb & Dweck, 1994; also see Giles, 2003). Yet previous research had not examined whether implicit theories would affect high school adolescents' aggressive retaliation.

Our research addressed this question (Yeager, Miu, Powers, & Dweck, in press; Yeager et al., 2011; Yeager, Trzemeski, et al., in press). We hypothesized that for adolescents in an entity theory framework, victimization or exclusion may be seen as being done by and to people whose traits cannot change—for example, by a “bully” to someone who is considered a “loser.” Even more, the “bully” might be seen as a permanently “bad person” who deserves to be punished,

whereas they themselves may feel like “losers” who are permanently not likable. Under these conditions, harming the transgressor who made them feel that way may seem more satisfying. On the other hand, from the perspective of an incremental theory, victimization may be thought of as being done by and to people who can change over time. Thus, learning an incremental theory might reduce the desire for aggressive retaliation by allowing adolescents to see their future as more hopeful and by creating a greater desire to understand the motives of transgressors and, where appropriate, to influence them (Yeager, Trzesniewski, et al., in press).

Do implicit theories of personality predict responses to peer conflicts? Yeager et al. (2011) began by investigating whether adolescents who endorsed more of an entity theory of personality would offer more vengeful responses to peer conflicts. To measure an entity theory, Yeager et al. (2011) asked high school students how much they agreed with statements such as “Bullies and victims are types of people that really can’t be changed.” Next, we asked adolescents to write about a time that a peer upset them, and to rate their desire for vengeance—that is, how much they felt like “hurting,” “getting back at,” or “wishing someone would hurt” the peer. In a diverse sample of adolescents that included students from urban America and from across the nation of Finland, we found that those with more of an entity theory reported a significantly greater desire for revenge following a peer conflict and a reduced desire to forgive the peer (Yeager et al., 2011). What would those with more of an incremental theory do? In subsequent research, we found that those with more of an incremental theory were more likely to say they would address a peer who had intentionally bullied them and try to productively educate them about the harm their behaviors had caused (Yeager & Miu, 2011). That is, those with an incremental theory were not passive recipients of victimization. To the contrary, they sought out positive solutions to proactively improve their situation; they were more resilient.

Does teaching adolescents an incremental theory of personality increase resilience following peer conflicts? In an initial experimental test of this question, Yeager et al. (2011, Study 3) temporarily oriented high school students toward an incremental view. First, all participants read a brief scenario about a student who was a victim of bullying in school and were asked to imagine that they were that victim. In the randomly assigned incremental condition, however, students learned from peers and adults that people’s characteristics can be developed and are not fixed. They read brief summaries of longitudinal, correlational and experimental studies that showed that people’s personal characteristics could change. Students in the randomly assigned control group read the same scenario without the incremental theory message. Then all students rated how they would like to respond to the bullying peers in the scenario, in-

cluding how much they would desire vengeful aggression. Yeager et al. (2011) showed that students in the incremental theory group were significantly less likely to endorse aggressive, vengeful responses to the bullies. This finding has been replicated in other studies conducted with students from both high-income and low-income communities (e.g., Yeager & Miu, 2011; Yeager, Miu, et al., in press). These results were encouraging because they showed that adolescents are not stuck in an entity way of thinking; they can be led to adopt more of an incremental framework.

How do theories of personality lead to resilience? Implicit theories of personality have their effects by fostering patterns of attributions and emotions about both the transgressor and the self. For instance, after imagining being the victim of bullying, those with more of an entity theory are more likely to say that the peer is a “bad person” (Yeager et al., 2011). Relatedly, after experiencing a peer conflict in which the intention of the peer was ambiguous, those with more of an entity theory were more likely to conclude that the peer “did it on purpose in order to be mean” (Yeager, Miu, et al., in press). Each of these attributions about the peer can mediate the effect of implicit theories on a desire for vengeance, and each can be reduced when adolescents are experimentally led to adopt an incremental theory (Yeager et al., 2011; Yeager, Miu, et al., in press).

The entity and incremental theories also produce differences in attributions about oneself. Those with more of an entity theory attribute experiences of social exclusion to their own traits—that “maybe I’m just not a likable person” (Erdley et al., 1997). These self-blaming attributions can give rise to feelings of shame (Tangney, Stuewig, & Mashek, 2007; cf. Graham & Juvonen, 1998), and in our data shame is a strong predictor of both hatred for a peer and a desire for revenge (Yeager et al., 2011). An incremental theory, on the other hand, sets up a psychological world in which shame is less likely as a response to social adversity. Our incremental theory manipulation reduced shame following a peer conflict, and this reduction mediated in part the reduction in desire for revenge (Yeager et al., 2011). In sum, when adolescents facing social adversities are taught to hold more of an incremental theory of personality, they are less likely to condemn global, stable personal traits; they report feeling fewer negative emotions such as shame or hatred; as a result, they are less likely to desire revenge.

Do implicit theories of personality affect real-world aggression in urban high schools? In new research, we tested the hypothesis that an incremental theory intervention might, by changing the meaning of negative social events, lead to reductions in retaliatory aggressive behavior even in schools that have high levels of peer conflicts (Yeager, Trzesniewski, et al., in press). For both theoretical and practical reasons it was important to conduct this research. As noted, previous efforts to curb aggression have had limited

success in high school populations. Although it is easier to reduce aggression among children using comprehensive universal preventative interventions, analogous efforts among adolescents in high school often show no significant treatment effects (Karna et al., 2011; for narrative reviews and meta-analyses, see Fossum, Handegård, Martinussen, & Mørch, 2008; Merrell, Gueldner, Ross, & Isava, 2008; Smith, Schneider, Smith, & Ananiadou, 2004; Vreeman & Carroll, 2007; Wilson & Lipsey, 2007). Thus, it was essential to come to a greater understanding of the causes of adolescents' aggressive retaliation and also, given the previously noted research suggesting that adolescents are coming to see social traits are increasingly fixed, to develop effective interventions to stem these causes.

Our research (Yeager, Trzesniewski, et al., in press) started by creating a more extensive incremental theory of personality treatment than we employed in our previous brief experiments. Our new intervention involved six classroom sessions. In the first two, building on the Blackwell et al. (2007) intervention, students learned about the anatomy and function of the brain—for instance, that the brain thinks thoughts by sending signals between neurons and that these signals cause behavior. Students also learned about neuroplasticity and the brain's potential to change and reorganize itself when people learn and practice new ways of thinking. In the next two sessions, students were taught the core of the incremental theory of personality message: that people do not do things because of their traits or labels, but because of thoughts and feelings—thoughts and feelings that live in the brain and that can be changed. It is important to note that students were not taught that changing people was easy or guaranteed, or even that one person can, on their own, change another person. Instead, the intervention emphasized the *potential* for change throughout one's lifetime, despite the difficulty and uncertainty of it. In the final two sessions, students practiced applying these beliefs following peer conflicts through small-group discussions, reading and writing exercises, and role-playing.

In a double-blind randomized field experiment (Yeager, Trzesniewski, et al., in press), we evaluated the new intervention with 230 students attending a high school with substantial levels of conflict. For instance, 40% of students in this school said that they did not feel safe from threats, and many students were aligned with one of two rival gangs.

We compared our incremental theory of personality intervention to a six-session intervention that taught extensive social and emotional skills for coping with peer conflicts. This control condition workshop was highly analogous to the type of intervention that is often successful at reducing aggression among children and frequently attempted with high school students. In the control group, students were taught about positive and negative ways of coping with problems and practiced those methods of coping through scenarios, skits, and small-group discussion. Control group exercises and scenarios were for the most part identical to those used in the

incremental condition, were delivered by highly experienced and trained teachers, and were rated as equally enjoyable and informative. There was also a second, no-treatment control group.

We first assessed the impact of the interventions on behavioral aggression 1 month after the workshops ended. We did so through a standardized task in which students experienced exclusion during a virtual game of catch that they believed they were playing with two peers (the "Cyberball" paradigm; Williams & Jarvis, 2006). In fact, the other players were controlled by a computer. Students then had the opportunity to retaliate by assigning to the peer who ostensibly excluded them a chosen amount of a food that the peer did not like—in this case, uncomfortably spicy hot sauce (of course, students later learned that no one actually ate the hot sauce). Aggressive retaliation was indexed by how much of the hot sauce was allocated. Students also had the opportunity to take prosocial action; they were given the chance to write an anonymous note to accompany the hot sauce that went to the peer. This part of the experiment was conducted in the school by different research assistants and was presented as a separate study with no relation to the treatment or control workshops. It was highly realistic. In fact, testifying to the validity of our measure, the amount of hot sauce allocated during this brief experience was significantly correlated with students' probability of having been suspended for fighting in school.

Did learning the incremental theory make high school students behave less aggressively (and more resiliently) in response to exclusion? Yeager, Trzesniewski, et al. (in press) found that students in the incremental treatment group—who learned that people have the potential to change—showed far less aggressive retaliation on the hot sauce task 1 month postintervention. They allocated roughly 40% less hot sauce to the peer who had excluded them than did students in the control groups. They were also 3 times as likely to take prosocial action toward the peer who excluded them. That is, they wrote notes that warned the peer about the spiciness of the sauce and apologized for it, such as, "I tried to put only a little bit of the sauce because you circled you disliked it. So I hope it is not too much for you." Students in the control conditions, on the other hand, were more likely to write neutral or even menacing notes to the peer who excluded them in Cyberball, such as, "I gave you a lot because you don't like spicy!!!" These results are particularly striking because the coping-skills control group was explicitly taught 1 month earlier how to think and respond positively following peer conflicts, whereas the incremental theory group was only told to recognize people's potential for change. Yet the incremental group was the one that responded less aggressively and more prosocially following peer exclusion.

Would the incremental theory alter more chronic behaviors in school, outside of this controlled provocation? At the end of the school year, the students in the incremental theory treatment group were more likely than those in the control

groups to be nominated by teachers (who were blind to experimental condition and hypotheses) for improved conduct—in terms of both aggression toward peers and conduct in the classroom.

In sum, the incremental theory of personality intervention, by leading students to hold a mindset in which people had the potential to change, increased resilience among students at a school with substantial levels of peer conflict. It reduced aggressive retaliation and increased prosocial behavior following an experience of peer exclusion 1 month postintervention, and it improved overall conduct problems in school as assessed 3 months postintervention (Yeager, Trzesniewski, et al., in press).

Social Stress and Academic Performance

For many adolescents, the transition to high school is rocky. One new freshman—a participant in one of our studies—described it this way:

Some people in school began treating their friends, including me, in a way that showed we weren't as close or not important anymore. . . . This morning I was walking by and all the person could do was act as if I weren't there. Seeing them and they just look you in the face without a "hi" or smile makes me feel invisible.

Imagine the stress of this experience when seen through the lens of an entity theory of personality. From that perspective, these early adversities are not seen as part of a normal transition but rather as diagnostic information about one's (seemingly bleak) social future. Under these circumstances, it is easy to see that an entity theory leads a student to experience greater stress following even minor instances of peer exclusion or victimization. By the same token, a well-timed nudge toward more of an incremental view—by emphasizing the potential for change—might substantially change the meaning of these early negative social events and, by doing so, might dramatically reduce stress and its consequences.

Thus, in some of our most recent research we have examined whether an incremental theory, by making victimization and exclusion seem less permanent, could reduce adolescents' stress following peer exclusion and perhaps even their chronic stress (Yeager, Johnson, Spitzer, & Dweck, 2012). We expected that if this were the case, then learning an incremental theory at a time filled with the potential for stress like the transition to high school might lead to a change in social-stress-related outcomes, such as academic performance (see Crosnoe, 2011).

To test this we had a new sample of high school freshmen ($N = 78$) complete a condensed version of our incremental theory of personality intervention in the 1st month of high school (Yeager et al., 2012). This intervention consisted of a two activities, each lasting one class period. First, both treatment and control groups attended an in-class work-

shop in which they were given an overview of how the brain functions, to provide background for the incremental theory message. Roughly 1 week later, students were given private envelopes with randomly assigned treatment or control reading and writing activities. In the treatment group, this activity first asked students to read a scientific article explaining the basis for the incremental theory of personality, and then asked students to write a note to a future ninth-grade student explaining how they can use that knowledge if they feel rejected, victimized or left out (cf. Aronson et al., 2002). The control group completed a highly similar activity that was positive and optimistic but did not teach the idea that people's personality traits can change. Like previous implicit theories interventions, this was a double-blind randomized field experiment, meaning that teachers were unaware of the treatment messages and students were unaware that they were randomly assigned to condition or that the treatment was designed to be helpful for their stress or grades.

One to 2 days after students completed the intervention, we assessed the level of stress they felt following social exclusion. To do so, we had students participate in the Cyberball experience of exclusion (Williams & Jarvis, 2006), and they rated their stress levels afterward. Did the incremental theory intervention reduce stress? It did, substantially—by roughly $.5 SD$.

We next examined whether these reports of stress after an experience of exclusion could provide insight into students' more chronic experiences of stress over time. We tested whether overall life stress would be reduced in the treatment group 8 months postintervention, at the end of their freshman year. It was, by roughly the same amount— $.5 SD$. Moreover, the effect on long-term stress was statistically mediated by differences in acute stress measured after the Cyberball exclusion 8 months earlier. Thus, a relatively brief intervention to teach an incremental theory of personality at the beginning of the year appeared to buffer adolescents from individual instances of social stress and, over time, to lower their chronic levels of stress.

If the intervention could reduce stress, could it also affect behaviors related to social stress in school, such as academic performance (Crosnoe, 2011)? We examined students' grades in core classes (English and Math) over the 8-month period following the incremental theory of personality intervention. We found that in the control group there was a steady decline in grades over the year, which is common for students who transition to high school (Benner, 2011). However, for those in the incremental theory treatment group this decline in grades was slowed substantially, resulting in a difference in grades of roughly one third of a grade point between the incremental group and the control group over the year (Yeager et al., 2012). This effect of the incremental theory treatment on achievement was fully mediated by the difference in stress between the two groups.

Hence, an incremental theory, in addition to reducing retaliatory aggression (Yeager, Trzesniewski, et al., in press),

can reduce perceptions that experiences of peer exclusion are stressful (Yeager et al., 2012). Over time, this can add up to long-term differences in both overall stress and academic achievement.

Summary

Coping with peer victimization or exclusion can be challenging for any adolescent. This may be especially true if these events happen during difficult transitions such as the 1st year at high school, as students are trying to form new friendships, adopt new identities, and navigate the social labels given them by peers—labels that are not always to their liking. Our research suggests that adolescents are more vulnerable to these social adversities when they hold a mindset in which they and their peers are not likely to change. However, when adolescents have or are taught a mindset in which people have the potential to change their socially relevant traits—even if those traits are difficult to change—then they can be more resilient in the face of victimization or exclusion.

QUESTIONS

These findings commonly raise (at least) three questions, and we address them next.

1. How Can Changing Mindsets Improve School Outcomes Without Removing the Objective Adversities in Students' Environments?

The intervention experiments previously described were designed to change students' mindsets and, to test the effects of doing only this, did not try to affect the objective school environment. Teachers and parents were unaware of the incremental theory messages, and curricula and pedagogy were unchanged. Yet the implicit theories interventions significantly improved adolescents' functioning over time. How can this be?

This is possible because, as noted earlier, a child's interpretations of adversity can determine whether that adversity affects a child's outcomes (Beck, 1967; Olson & Dweck, 2008). The method to create resilience shown in this article relies on this idea and shows that one way to prevent an adverse situation from worsening a child's outcomes is to interrupt the child's potentially negative interpretations of the situation—in this case, by changing implicit theories toward more of an incremental view. This approach does not deny the profound impact of the environment on children (teachers, peers, parents, neighborhoods, curricula), but it highlights the psychological factors within the student that can be more readily changed (Olson & Dweck, 2008).

Our approach is counterintuitive for those who may not think of major school reform in terms of addressing the beliefs of the students. More often, school reform has attempted

to address structural factors such as the size of the school, the quality of the teachers or the length of the school day, or they have attempted to directly teach students skills for studying or learning. These efforts are undoubtedly important. But they rest on the assumption that the reason students are not learning or engaging is because students have not been given the correct resources or skills. We propose that this may not always be the case. Sometimes the forces in a system are adequate to support learning, but students have mindsets that prevent them from fully taking advantage of those forces (Yeager & Walton, 2011; cf. Lewin, 1947). As a result, a well-timed and psychologically precise intervention to address those mindsets can unlock the latent effectiveness of educational environments and lead to long-term effects on students' achievement (Yeager & Walton, 2011).

2. Can Messages From Adults Unintentionally Create Mindsets That Undermine Resilience?

Students' mindsets can be affected by the subtle messages they receive from adults. Even seemingly positive teacher or parent behaviors—such as praise or comfort for struggling students—can lead students to adopt more of a fixed, entity theory and by doing so unintentionally undermine resilience. We review some of this evidence next.

In a series of studies, Mueller and Dweck (1998) showed that praising students for being “smart” leads students to endorse more of an entity theory and to respond with less resilience following academic setbacks. To demonstrate this, Mueller and Dweck gave fifth-grade students a set of logic problems matched to their grade level. After completing them, students were praised. Some children (randomly assigned) received intelligence praise (“That’s a really high score; you must be smart at these problems”). Others received praise that focused more on process rather than ability (“That’s a really high score; you must have worked hard at these problems”) or neutral praise (“That’s a really high score”). Next, students were given an especially difficult set of problems on which all students performed poorly. Finally, students were given a crucial third set of problems equal in difficulty to the first set. The type of praise had a substantial effect on the students. The intelligence praise led students to adopt more of an entity theory and led the majority of them to say that they would only like to do easy problems, not challenging ones. Strikingly, intelligence praise also compromised performance. Children who received intelligence praise solved 30% fewer problems on the final trial relative to the first trial. They were also more likely to misrepresent their scores, claiming that they performed better than they actually did. Students who received process praise, by contrast, did significantly better on the third trial than they had done on the first trial, and they asked to do more challenging problems in the future—they adopted the incremental theory. What is surprising about Mueller and Dweck’s (1998) finding is that many parents or educators might believe that praising

students for being “smart” could buffer them from feeling “dumb” when they encounter a setback. Ironically, however, the opposite is true. Research on implicit theories shows we should not praise children for being “smart” when they do well, but rather, to promote resilience, praise them for the process they engaged in—their effort, their strategies, their focus, or their persistence.

How should we comfort students when they do not perform well? Parents and teachers may believe that when a student struggles in a subject it is best to acknowledge that it is not their fault—that it simply is not their “strength”—and to encourage them to focus on their successes in other domains. However, new research shows that this strategy grows out of an *adult’s* entity theory: The adult’s belief that a struggling student has low ability in that area and will never do well in it. This, in turn, can create low confidence and poor resilience in students. In a series of experiments, Rattan et al. (2012, Studies 1–3) showed that teachers (or adults acting as teachers) who held more of an entity theory were more likely to say they would tell struggling students that they were just “not a math person,” and then want to assign them less math homework. Next, Rattan et al. (Study 4) showed that giving this kind of feedback could affect students’ resilience. They found that comforting students for not being a “math person” led to lower expectations of improvement on the part of students and to lower expectations for their final grade in the course. This was true even though students in all experimental conditions were also told the teacher viewed them as having high overall ability in other areas; this “positive buffer” did not neutralize the negative effect of the entity feedback. Hence, entity “comfort” is not in fact comforting from the perspective of the student. Of importance, Rattan et al. showed that there is a better way to provide feedback when students do not perform well: help them see that they need better strategies. When a teacher said that they needed to meet with a tutor to improve their strategies, they viewed their teacher as having more of an incremental theory of math, and the students had higher expectations for their own performance in the future. Hence, as in Mueller and Dweck’s (1998) research, focusing more on process than on ability can put students in a mindset that helps them respond to challenges resiliently.

Future research might investigate whether a similar effect holds for implicit theories of personality. For instance, in an effort to comfort adolescents who experience peer exclusion or bullying, parents or teachers may use (or imply) fixed labels (e.g., “They’re just bullies,” “They’re bad people and you’re not”). These labels, though designed to help a victim cope, may be creating a mindset in which a peer is seen as unable to change. And, as we now know, these judgments produce more vengeful responses to social conflicts (e.g., Yeager, Miu, et al., in press). Notably, it is possible to comfort children without implying that the aggressor will always be a “bad person.” A parent might acknowledge the injustice of being bullied, but also point to the situational or

psychological causes of the peers’ behavior, rather than to fundamentally flawed—and fixed—character traits. Perhaps designating a *behavior* as bad—but not the transgressor himself or herself as unchangeably bad—may also be effective. These are potential ways to deflect self-blame, and to acknowledge the difficulty of being bullied without fueling a desire for revenge (Yeager, Miu, et al., in press).

3. How Should Incremental Theory Interventions Be Scaled Up to Affect More Students?

A final question involves how to use these psychological strategies to affect resilience on a broader scale. As Yeager and Walton (2011) have argued, scaling up social-psychological interventions is not as simple as delivering the same worksheets and workshops to more students. Incremental theory interventions have their effects because they (a) include messages that precisely target the way an entity theory is affecting students in a given context and (b) are delivered using methods that lead students to quickly internalize those messages (Yeager & Walton, 2011). If attempted at a larger scale, implicit theories interventions will need to retain each of these features.

To do so, sometimes implicit theories interventions will need to be customized for a given population. The Blackwell et al. (2007) and Good et al. (2003) interventions affected middle school students’ psychology by focusing on the idea that putting forth greater effort in the service of learning could strengthen students’ brains. But through interviews, focus groups, and national surveys with community college students in remedial math classes, Yeager (2012) found that community college math students frequently put forth great effort but use very poor strategies and do not ask for help. Although strategy use and help-seeking were certainly embedded in the Blackwell et al. (2007) intervention, they were brought to the fore for the community college intervention (Paunesku et al., 2012). In the revised incremental theory intervention, the “formula” for success was “Effort + Strategies + Help From Others.” And, as the reader may recall, this intervention had striking effects on course completion several months later.

All customization is not guaranteed to be effective, however. There is the potential to lose sight of the core message and focus instead on scaling up the superficially related but psychologically “inert” portions of the intervention. For instance, a tempting (but ineffective) implementation of an implicit theories intervention would be to provide students with extended lectures about the brain’s structure and function but not to pay sufficient attention to the brain’s potential to change or to the idea that struggling grows new neural connections rather than meaning you are “dumb.” The neuroscientific information undoubtedly facilitates the incremental theory treatment effect—not only is neuroscience intrinsically interesting, but experiments show that psychological arguments are more compelling when they are accompanied

by neuroscientific data (Weisberg, Keil, Goodstein, Rawson, & Gray, 2008). However, the neuroscientific information is not, in and of itself, the intervention. An incremental theory message must convey to adolescents that people's characteristics, which are based in the brain, have the potential to be developed. In fact, the Paunesku et al. (2012), Blackwell et al. (2007), and Yeager, Trzesniewski, et al. (in press) studies were direct tests of this proposition; the control conditions also taught about the parts and functions of the brain, yet only the incremental theory conditions, which taught about the potential to develop personal qualities, led to increased levels of resilience.

Thus, occasionally implicit theories interventions need to be customized to address the mindsets of students of a given age and in a given context. At the same time, we do not believe that this should be done without deep knowledge of the underlying psychology that the interventions are trying to instill. For this reason, collaborative partnerships between researchers, practitioners, and students may be necessary to engineer interventions that will work at scale (Yeager & Walton, 2011).

A final question for bringing interventions to scale involves context-specificity, or whether an implicit theory learned in one context (such as during school) will or can be made to transfer to another context (such as out-of-school activities or at home). Indeed, the question of knowledge transfer is a vibrant and contentious one in the cognitive psychology of learning (Day & Goldstone, 2012; Schwartz, Chase, & Bransford, 2012). Although, in general, transfer has been elusive, some recent research has documented effective methods for promoting transfer of scientific theories across contexts (Schwartz, Chase, Opezzo, & Chin, 2011). Hence, an important question is the extent to which implicit theories taught in one context tend to transfer across contexts and whether novel intervention methods that draw on insights from cognitive psychology might facilitate such transfer.

Implicit Theories and Resilience

In this article we have shown that students' implicit theories about the potential for personal characteristics to be developed can affect resilience following academic and social adversities. As we have demonstrated, the different implicit theories—entity and incremental—create distinct psychological lenses that filter people's experiences of these adversities and, by doing so, lead to different patterns of vulnerability or resilience. On a broader theoretical level, we have provided evidence that resilience is not exclusively a quality of a person or of a context, but rather it can also be the consequence of a person's interpretations of the adversities they are facing. It is important to note that this analysis provides great promise for the development of brief but powerful interventions to change students' interpretations and to address, at least partially, some of the most critical social problems

facing students: underachievement and responses to peer victimization.

That improving resilience was possible even among students who may have had a lifetime of unproductive beliefs about personal characteristics—for instance, adults taking remedial math in college (Paunesku et al., 2012) and adolescents attending high schools with high levels of aggression (Yeager, Miu, et al., in press; Yeager, Trzesniewski, et al., in press)—reinforces the notion that it is crucial that researchers and educators continue to pay attention to unproductive mindsets. Of course, problems such as academic achievement and responses to peer victimization are complex and multidetermined. As such, they are likely best addressed by also continuing efforts to provide students with the skills, resources, and beneficial environments they require to thrive.

CONCLUSION

As students move through our educational system, all of them will face adversity at one time or another, whether it is social or academic in nature. Thus, a central task for parents and educators is to prepare students to respond resiliently when these inevitable challenges arise. Although educators and parents have intuitive strategies for doing so, many of these strategies may be ill-advised, such as praising students for being "smart" to boost their self-esteem or condemning those who behave aggressively as evil bullies. This is why we need scientifically tested methods to tell us how to truly promote resilience. Our research has looked at these adversities through the eyes of students to try to capture the underlying psychology of what causes some students to feel vulnerable, discouraged, or stressed when they face challenges. We have found that what students need the most is not self-esteem boosting or trait labeling; instead, they need mindsets that represent challenges as things that they can take on and overcome over time with effort, new strategies, learning, help from others, and patience. When we emphasize people's potential to change, we prepare our students to face life's challenges resiliently.

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