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Do Rewards Reinforce the Growth Mindset?: Joint Effects of the Growth Mindset and Incentive Schemes in a Field Intervention

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The current study draws on the motivational model of achievement which has been guiding research on the growth mindset intervention (Dweck & Leggett, 1988) and examines how this intervention interacts with incentive systems to differentially influence performance for high- and low-achieving students in Indian schools that serve low-SES communities. Although, as expected, the growth mindset intervention did interact with incentive systems and prior achievement to influence subsequent academic performance, the existing growth mindset framework cannot fully account for the observed effects. Specifically, we found that the growth mindset intervention did facilitate performance through persistence, but only when the incentive system imparted individuals with a sense of autonomy. Such a facilitation effect was only found among those students who had high prior achievement, but not among those who had underperformed. When the incentive did not impart a sense of autonomy, the growth mindset intervention undermined the performance of those who had high initial achievement. To reconcile these discrepancies and to advance understanding of the impacts of psychological interventions on achievement outcomes, we discuss how the existing theory can be extended and integrated with an identity-based motivation framework (Oyserman & Destin, 2010). We also discuss the implications of our work for future research and practice.

Keywords: growth mindset, implicit theories, incentives, achievement, Identity-based motivation

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> Development policy is due for a redesign. . . . The World Development Report . . . demonstrates that a more realistic understanding of choice and behavior can make development interventions much more effective.
> (World Bank, 2015)

Increasingly, policymakers worldwide are paying attention to human psychology when designing evidence-based interventions to promote well-being (Halpern, 2015; World Development Report, 2015). Early psychological interventions in educational settings are considered as an indispensable component of this effort, because initial differences in beliefs and motivation among children have long-term implications for their achievement and health outcomes (e.g., Blackwell, Trzesniewski, & Dweck, 2007; Oyserman, Fryberg, & Yoder, 2007; Wigfield & Eccles, 2000). As Halpern (2015, p. 769) put it, "identifying school-based interventions that can boost attainment—particularly of more disadvantaged students" is a key area of active research, and "many of the most powerful interventions seem to involve fostering soft skills . . . and 'thinking how to think.'"

Both the World Development Report, 2015 and the Global Insights Initiative (GINI) launched by the World Bank in October 2015 have highlighted the importance of the "growth mindset intervention," which teaches students that their abilities are malleable and can be improved, rather than fixed and unchangeable. Guided by a motivational model of achievement (Dweck & Leggett, 1988; Dweck & Sorich, 1999; Henderson & Dweck,

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This study belongs to a larger project conducted in schools run by a nongovernmental organization in Indian slums. A separate study under this project focused on the impact of economic incentives on the students. That paper and the current article have different focuses, address different research questions, and target different audiences. It reports on a different subset of students from those in this paper. It does not examine the growth mindset intervention or the effect of autonomy in incentive choice, which are the key variables of interest in this article. The published version of that paper is available at http://www.sciencedirect.com/science/article/pii/S0272775716304071.

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1990), this intervention rests on the idea that fundamental beliefs about human nature can set up interpretation mindsets in response to challenge and setback. Therefore, it aims to foster students' motivation to learn and to pursue challenges by changing their mindsets (Dweck, 2000, 2007). In the United States, in-school (Blackwell et al., 2007; Yeager, Walton, et al., 2016) and large-scale online (Paunesku et al., 2015) studies have found that such interventions encourage students to persist and to improve their performance, and that this effect is especially strong among low-achieving students (Dweck & Leggett, 1988; Yeager, Walton, et al., 2016).

Much of the evidence supporting the growth mindset intervention (Blackwell et al., 2007; Paunesku et al., 2015; Yeager, Romero, et al., 2016) comes from American contexts. However, context matters greatly in general, and in early education interventions in particular. Scholars have recognized that although there are universal psychological processes (Bennis & Medin, 2010; Danks & Rose, 2010; Maryanski, 2010; Meadon & Spurrett, 2010), there is considerable variability in self-concepts, motivation, and behavior across different populations (Henrich, Heine, & Norenzayan, 2010; Chiao & Cheon, 2010) and across contexts (Ceci, Kahan, & Braman, 2010; Kesebir, Oishi, & Spellman, 2010; Khemlani, Lee, & Bucciarelli, 2010; Rai & Fiske, 2010). Although global policy initiatives have been advocating for implementation of the growth mindset intervention worldwide, we know little about whether and how these results transfer to developing countries, which are the intervention targets of the World Development Report (2015) and the GINI. Therefore, as Paunesku et al. (2015, p. 791) put it, "[a] critical next step is to examine how mindset interventions interact with diverse contexts." Consistent with this call, this article examines the effectiveness and the boundary conditions of this psychological intervention in a large-scale field experiment conducted in a school network that serves low-SES children in Indian slums.

Research has examined different types of psychological interventions that aim to improve students' engagement and performance. The growth mindset (Blackwell et al., 2007; Paunesku et al., 2015) notwithstanding, incentive systems are possibly the most common form of intervention to have been adopted in educational settings (Angrist & Lavy, 2009; Fryer, 2011; Gneezy & Rustichini, 2000). Educational institutions commonly use incentive systems to motivate, evaluate, and recognize students' achievement. Policymakers who propose psychological interventions therefore need to understand how their interventions may work in conjunction with existing reward structures in these schools. The current research presents an integrative framework that examines whether and how different incentive systems might interplay with the growth mindset intervention, and under what conditions the two types of interventions might reinforce each other.

In what follows, we develop our hypotheses based on the motivational model of achievement that has been guiding research on the growth mindset (Blackwell et al., 2007). We theorize about how the mindset intervention might interact with incentive systems to differentially influence subsequent performance for high- and low-achieving students. We then report on a field experiment that tested our hypotheses. Although, as expected, the growth mindset intervention did interact with incentive systems and prior achievement to influence subsequent academic performance, the specific directions of the effects we observe are at variance with the existing growth mindset framework. Consequently, we propose an extension of the existing theory that integrates it with the identity-based motivation framework (Oyserman & Destin, 2010) which allows us to reconcile the discrepancies and to advance our understanding of the impacts of psychological interventions on achievement outcomes. We conclude with a discussion of the implications of our work for future research and practice.

Theoretical Development

The growth mindset intervention is based on a motivational model of achievement (Dweck & Leggett, 1988; Dweck & Sorich, 1999; Henderson & Dweck, 1990). *Achievement motivation* refers to the drive to excel. The basic premise of the model is that students hold different "lay theories" about their ability. These theories help individuals make sense of their environment and guide their decisional and behavioral choices in achievement settings. Whereas some believe that their ability is a fixed entity that cannot be changed, others believe that their ability is a malleable attribute that can be developed. A belief in malleable ability is a key characteristic of the growth mindset. The growth mindset orients individuals to seek challenges. Believing that they can change and improve themselves, individuals with growth mindsets worry less about making mistakes. Instead, they aspire to master knowledge and develop strategies that facilitate learning (Dweck & Leggett, 1988). In the face of setbacks, they are more likely to attribute failure to the lack of personal effort rather than to the lack of ability (Blackwell et al., 2007; Henderson & Dweck, 1990). Thus, they tend to be more persistent, investing more effort and displaying fewer helpless responses, such as withdrawal behavior or experience of negative affect (Robins & Pals, 2002).

Given that the growth mindset is associated with more adaptive coping strategies and responses (Dweck & Leggett, 1988), it has far-reaching impacts on psychological and physical health, as well as on achievement outcomes (Yeager et al., 2014). For example, results from experimental and longitudinal studies have shown that a stronger endorsement of growth mindset is associated with greater academic engagement (Aronson, Fried, & Good, 2002) and an upward trajectory in grades over time (Blackwell et al., 2007). Accordingly, the growth mindset intervention aims to promote beliefs about the malleability of abilities to foster interest in learning. It highlights the potential to change and the importance of hard work, and presents challenges and difficulties as opportunities to learn and grow (Paunesku et al., 2015).

In a typical growth mindset intervention, students learn that just like other muscles in their bodies, the brain grows stronger with repeated exercise. In particular, when they persist in the face of challenges, the brain develops new connections and becomes more capable of tackling difficult tasks (Blackwell et al., 2007). A key feature of this intervention is that it connects personal effort and hard work to better performance outcomes (Rattan, Savani, Chugh, & Dweck, 2015), increasing the expectancies for success (also see Wigfield & Eccles, 2000). Another important feature is its emphasis on the possibility for one to grow and to improve oneself (Dweck & Leggett, 1988), imparting individuals with a sense of autonomy and control over their performance outcomes. As the growth mindset encourages students to be resilient and persist despite failure, it can reduce the achievement gap by enhancing the

performance of underperforming students (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013; Dweck & Leggett, 1988).

It is noticeable that almost all the extant research on the growth mindset has been conducted in Western settings. On the basis of the available evidence, one would expect that the effect of the growth mindset intervention should be generalizable to a different culture, such as India, because the tendency to focus on fixedness (vs. malleability) of personal attributes is a cultural universal (Church et al., 2006). More importantly, growth mindsets should influence the judgment and attitude of individuals from American and Asian cultures in a similar manner (e.g., Chiu, Hong, & Dweck, 1997; Chiu, Dweck, Tong, & Fu, 1997; Lim, Plucker, & Im, 2002). Hence, consistent with the motivational model of achievement (Dweck & Leggett, 1988; Dweck & Sorich, 1999; Henderson & Dweck, 1990) and the principles advocated by the global policy initiatives (e.g., World Bank, 2015; World Development Report, 2015), we expected that the growth mindset interventions (vs. Control; no intervention) would help to reduce the performance gap between students by increasing the persistence of those who once underperformed. However, little research has examined the effect of growth mindset in developing countries, which are the focus of the global policy initiatives; hence, it is important to test whether its effectiveness does indeed transfer to such a context.

The Interplay Between Growth Mindset and Incentive Systems

Incentive systems have been widely used in education settings to enhance academic engagement (Angrist & Lavy, 2009; Fryer, 2011; Gneezy & Rustichini, 2000). They can influence how students understand and interpret their learning experiences (Sandel, 2012). External rewards can enhance or undermine motivation, depending on how the rewards are structured and distributed. Specifically, some studies have shown that external rewards undermine intrinsic motivation to engage in a behavior (e.g., Deci, 1971; Lepper, Greene, & Nisbett, 1973), because the presence of external rewards results in overjustification. That is, the rewards lead individuals to shift the focus from internal causes (e.g., "I enjoy doing this") to external causes (e.g., "I am doing this because I get a reward") when engaging in an activity, reducing the interest and desirability of that activity. Others have suggested that rewards undermine intrinsic interest only when individuals perceive their behavior to be driven primarily by the extrinsic reward (Amabile, Hennessey, & Grossman, 1986; also see Festinger & Carlsmith, 1959). From the learned industriousness perspective (Eisenberger & Rhoades, 2001), a reward can serve as a means to help improve performance if it is used to signal attributes and processes (e.g., learning in class) that can help individuals to learn how to attain desirable positive outcomes (e.g., academic achievement). More importantly, when rewards are seen as reflections and recognitions of achievement, they might increase intrinsic motivation (Rosenfield, Folger, & Adelman, 1980). Therefore, a carefully designed reward system that recognizes effort and learning should boost the effect of the growth mindset intervention by signaling how individuals can change and improve their abilities (see Eisenberger & Rhoades, 2001).

Under the growth mindset framework, the motivation to learn from challenges and to master knowledge is seen as a key attribute that contributes to academic success (Dweck & Leggett, 1988). Thus, reward systems that incentivize learning are in line with the core message of the mindset intervention and should enhance intervention effectiveness (see Rattan et al., 2015). Consequently, the question of whether and how rewards reinforce the growth mindset intervention devolves into the issue of how the specific incentive system is designed and implemented. The growth mindset should be more effective if it is paired with an incentive system that highlights how students can improve their abilities and that helps students to internalize the importance of effort and learning.

The Nature of the Incentive Systems

In line with the above discussion, our objective in designing the incentive system was to reinforce the growth mindset intervention by highlighting the means through which students can improve their abilities and helping students to internalize the growth mindset.

An intuitive and important means for students to improve their abilities is to attend classes regularly, so that they can participate in class activities that exercise their brains and help them learn. Incentivizing these learning processes and fostering a mastery orientation are consistent with the growth mindset (Dweck & Leggett, 1988; Elliott & Dweck, 1988). Thus, we incentivized student attendance to signal the importance of learning and knowledge mastery. When the incentive intervention was introduced in each class, the teachers explained to the students that attending school regularly would improve learning and academic achievement (see Baker & Jansen, 2000; Chang & Romero, 2008; Ford & Sutphen, 1996).

To design incentives that would help students internalize the growth mindset, we drew on research on culture and motivation, which has shown that individuals from different cultures might be more or less motivated toward achieving certain goals, depending on whether they are given personal choices in their goal pursuit (Iyengar, 2010). Specifically, whereas personal agency and control are seen as an indispensable component of an independent self-construal, fulfilling social expectations and choices made by important others is an integral part of an interdependent self-construal (Markus & Kitayama, 1991). For example, North American students with an independent self-construal tend to be motivated to pursue a goal when they are allowed to make personal choices, because that imparts them with a sense of control and autonomy. In contrast, although Asian students with a more interdependent self-construal also tend to be motivated to pursue a goal when they are given a sense of autonomy, they achieve even more when they are told that the goal has been set by important others (Iyengar & Lepper, 1999).

Given the cultural context of the current study, a question arises: Would an incentive system that highlights personal choices facilitate academic pursuit more (or less), compared with a system in which choices were made by important others? We reasoned that on the one hand, the growth mindset emphasizes the importance of personal effort and control in learning and mastering knowledge to enhance the subsequent performance of underperforming students; hence, an incentive system that emphasized personal control would best align with the core messages of the growth mindset intervention, and should be the most efficient in reinforcing its effectiveness by signaling the importance of autonomy. On the other hand,

Indian students were likely to have a more interdependent self-construal; thus, it appeared possible that they would achieve the most when their teachers—important others—helped them internalize the goals of learning and mastery of knowledge as communicated by the growth mindset intervention. Therefore, in the current study, besides varying whether incentives were given or not, we also varied whether the incentives were to be selected by the students themselves, to impart them with a sense of autonomy, or by their teachers, important others whose expectations the students aspired to fulfil. That is, students either were not offered any reward (no reward control), received rewards of their own choice (personal choice), or received rewards that were chosen for them by their teachers (teacher choice).

Summary

Drawing on the motivational model of achievement which has been guiding research on growth mindset intervention, the current study examines whether and to what extent findings from previous studies in American context translate to a developing country, such as India, and how different incentive structures might differentially influence intervention effectiveness by reinforcing the core message of the growth mindset. We expected that the growth mindset intervention would help narrow the achievement gap by motivating those who underperformed to persist, which in turn would facilitate actual performance. We also expected that its effects would be enhanced further by incentives. Drawing on existing work on culture and motivation, we reasoned that incentives that aligned with the core principles of autonomy underlying the growth mindset, or incentives that helped students to internalize the growth mindset expectations of important others could enhance the effectiveness of the growth mindset. That is, we expected that growth mindset interventions would interplay with incentive systems and prior achievement to influence subsequent academic performance through increasing persistence.

Method

Empirical Context

This study was part of a larger project that was conducted in collaboration with a nongovernmental organization (NGO) that operates education centers or nonformal schools in slum areas in a large city in western India. Across 300 neighborhoods in the city, these schools serve low socioeconomic status students in Grades 1, 2, and 3. Each school is housed in a single room in a slum, and is equipped with basic school supplies. Students of the same grade and from the same or neighboring slums are enrolled in the same class.

To ensure the quality of education, the NGO provides intensive training to all teachers. Most teachers have a Grade 12 certificate (equivalent to a high school diploma) and have participated in a 30-day training program in a typical school year. They are trained to closely follow day-to-day lesson plans designed by a specialist team, which consist of subject specialists with bachelors' or masters' degrees. In addition, supervisors visited each class once a week to observe and provide feedback to the teachers. When particular students have difficulty with certain topics, the specialist team also visits the classroom to assist. Information gathered from class visits serves as feedback for modifying future lesson plans. An evaluation of this NGO's education operations by an independent agency showed that these schools were very effective. With its flexible, yet standardized, curriculum structure and teaching support, students from these education centers outperformed their peers from the local mainstream municipal schools (Educational Initiatives, 2010).

The NGO is receptive to evidence-based practices that help improve student performance. Given that prior research has established the effectiveness of the growth mindset and incentive interventions, the NGO worked closely with the research team to design and implement the intervention plan of this study.

Participants and Design

The current study targeted 2,420 students in Grade 3 in 107 randomly selected classes operated by the NGO. The average class size was 22.62 (SD = 5.16). Four classes were excluded because of administrative reasons (the NGO reassigned teachers in these classes from one experimental condition to another condition due to personnel changes during the course of the study). The study followed a 2 (Mindset: Growth vs. Control) × 3 (Reward: Personal Choice vs. Teacher Choice vs. No Reward Control) between-subjects design (see Table 1), with prior achievement measured as a continuous variable. We adopted a randomized block design (see Kirk, 2012) to assign the 107 participating classes across conditions (see Table 2). All students in the same class received the same combination of treatments. Classes that were in the same neighborhood were assigned to the same condition to prevent teachers and students from different conditions learning about the other interventions. Therefore, 16–20 classes were assigned into each of the 2 × 3 conditions. At the end of the academic year, all students completed the Assessment of Scholastic Skills Through Educational Testing (ASSET) test administered by an independent testing authority, Educational Initiatives. The test answers were recorded on bubble sheets and optical mark recognition machines were used to score them. The testing authority charged per exam score. Because of budgetary restrictions, the NGO randomly sampled an average of nine students from each class and obtained their ASSET test scores. Thus, we have test score data for a total of 949 students (51% female; M_{age} = 8.23). This sample size gives us 99% power to detect a three-way interaction with a medium effect size (Faul, Erdfelder, Buchner, & Lang, 2009). The ASSET test score was our key dependent measure.

Interventions

As mentioned, a specialist team was in charge of designing the curriculum and training the teachers on an ongoing basis. Our research team worked closely with this specialist team before the start of the academic year to tailor the interventions for the current study and to integrate the interventions into the daily lesson plans.

Mindset intervention. This intervention drew on past research (Aronson et al., 2002; Blackwell et al., 2007). In the growth mindset conditions, ten 1-hr lessons were developed to teach the students about the brain. During these lessons, the teachers described the structure and functions of the brain, how it works, and how it builds new neural connections as knowledge develops,

Table 1
Research Design Summary

Mindset conditions	Reward conditions		
	No reward control	Personal choice	Teacher choice
Control	Learned about the heart in 10 one-hour sessions: Structure & function of the heart	Learned about the heart in 10 one-hour sessions: Structure & function of the heart	Learned about the heart in 10 one-hour sessions: Structure & function of the heart
	No discussion of the importance of attendance	Emphasized the importance of attendance & public tracking of attendance	Emphasized the importance of attendance & public tracking of attendance
	No public tracking of attendance	Self-chosen rewards for children	Teacher-chosen rewards for children
Growth	Learned about the brain in 10 one-hour sessions: How the brain grows	Learned about the brain in 10 one-hour sessions: How the brain grows	Learned about the brain in 10 one-hour sessions: How the brain grows
	No discussion of the importance of attendance	Emphasized the importance of attendance & public tracking of attendance	Emphasized the importance of attendance & public tracking of attendance
	No public tracking of attendance	Self-chosen rewards for children	Teacher-chosen rewards for children

which makes people grow smarter. The teachers used this as the starting point to discuss how hard work and good learning strategies could help the brain to grow and deal with challenges. Importantly, the students learned that academic setbacks did not indicate limited potential and that these challenges provided opportunities to learn and grow. Class exercises and activities were also developed to help reinforce the idea of learning and growth. In the control conditions, students learned about the circulatory system and the structure and functions of the heart. There was no discussion of learning, growth, or dealing with setbacks.

To assess the effectiveness of the mindset intervention, research assistants who were blind to the hypotheses conducted one-on-one interviews with a randomly selected subgroup of 473 students from the 949 students participating in this study. Each student was interviewed twice: about two months before, and then one month after the intervention. During both interviews, the students were presented with a picture of a classroom just like theirs. The picture depicted a teacher asking a child to answer a math question (see Rattan, Good, & Dweck, 2012). The students were told that the child was unable to solve the problem, and then went home and did math practice exercises. The next day, the teacher asked that child another math question. The students were asked to indicate how well the child would perform, on a 5-star scale ranging from 1 star (*extremely poorly* to 5 stars (*extremely well*). The result revealed a significant intervention effect on the responses of the students before versus after the intervention, $\gamma = .34$, $SE = .15$,

Table 2
Descriptives of Key Variables

Mindset conditions	Reward conditions											
	No reward control				Personal choice				Teacher choice			
	Number of schools	*n*	*M*	*SD*	Number of schools	*n*	*M*	*SD*	Number of schools	*n*	*M*	*SD*
Control	20	181			18	135			18	164		
Prior performance (out of 60)			43.29	9.58			44.09	10.49			45.61	9.04
Persistence (questions attempted; out of 60)			55.40	8.98			56.36	9.64			53.02	11.51
ASSET performance (correctly answered; out of 60)			28.87	10.04			25.90	7.86			26.33	10.76
Correlations												
Prior performance and persistence			.27***				−.03				.19*	
Prior performance and ASSET performance			.20**				.29***				.19*	
Persistence and ASSET performance			.60***				.64***				.63***	
Growth												
Number of schools	16	139			20	186			15	144		
Prior performance (out of 60)			44.48	9.00			44.56	10.82			44.81	9.04
Persistence (questions attempted; out of 60)			56.70	7.43			56.47	7.75			56.72	4.92
ASSET performance (correctly answered; out of 60)			27.82	9.10			27.62	9.69			27.22	8.36
Correlations												
Prior performance and persistence			.08				.31***				.14	
Prior performance and ASSET performance			.06				.44***				.05	
Persistence and ASSET performance			.54***				.49***				.43***	

Note. ASSET = Assessment of Scholastic Skills Through Educational Testing.
* $p < .05$. ** $p < .01$. *** $p < .005$.

$z = 2.29$, $p = .02$. Specifically, after the mindset intervention students in the growth mindset condition expected that the child's performance would improve significantly with more practices, $\gamma = .44$, $SE = .11$, $z = 4.10$, $p < .001$, whereas students in the control mindset condition did not expect the child to improve, $\gamma = .10$, $SE = .10$, $z = .96$, $p = .34$.

Reward interventions. The growth mindset intervention highlighted that students can improve their ability by working hard and exerting effort to overcome challenges. Accordingly, the motivation to learn and to master knowledge is a key attribute contributing to the academic success of students. An important means that help students to learn is to attend classes and to participate in class activities regularly to help their brains exercise and grow. In line with this idea, the research team worked with the NGO's administrative team to identify rewarding student attendance as an appropriate means to signal the importance of learning and knowledge mastery. Although students might miss school due to external factors (e.g., illness, siblings in other schools having a day off, family obligations), they might also miss school because they lack personal motivation (e.g., wanting to play, attending festivals). Thus, to enhance the effectiveness of the mindset intervention, student attendance was incentivized to align the rewards with the core learning principles embedded in the growth mindset. Orthogonal to the mindset intervention, classes were randomly assigned to conditions such that the students either did not receive any reward (no reward control), received rewards of their choice (personal choice), or received rewards that were chosen for them by their teachers (teacher choice).

In the personal choice and teacher choice conditions, when introducing the reward scheme, the head teachers told the students that it was important for them to attend class regularly and participate in class activities. Skipping school would make it harder for them to understand the material that was taught, and also make it harder to learn subsequent material. For this reason, the school would reward students who attended school regularly. Specifically, students who attended more than 85% of school days during a 39-day period would receive a reward. The students were then shown samples of the rewards, which consisted of two pencils and one animal-shaped eraser. Results from a pilot study conducted in the previous year suggested that the rewards were appealing to the students. At the same time, they had small monetary value to avoid overjustification effects, which undermine their intrinsic motivation to learn (Amabile et al., 1986; Eisenberger & Rhoades, 2001; Festinger & Carlsmith, 1959).

The personal choice condition aimed to highlight the importance of autonomy in learning and mastering knowledge, so as to align with the emphases of the growth mindset on personal effort and hard work. Hence, in the personal choice condition, students were told that they would be able to choose their rewards. The teacher choice condition aimed to help students internalize the core idea of hard work advocated by their teachers in the mindset intervention without imparting a sense of autonomy. Students were told that the teachers would choose which rewards to give them. To ensure that the students understood the incentive structure clearly, individual attendance for each day was marked on a chart that was displayed inside the classroom. The no reward control condition was included in order to examine the default effect of the mindset intervention. No announcement was made in these classes about the importance of attendance and incentives. Attendance was also marked on a chart but it was not displayed publicly.

To assess the effectiveness of the reward intervention in encouraging students to attend at least 85% classes, we obtained the student attendance record during the reward period from each of the 107 classes. We received complete records for 2,410 students. Compared with students in the no reward conditions ($n = 809$), those in the personal choice ($n = 846$), $\gamma = .30$, $SE = .18$, $z = 1.66$, $p = .096$, and teacher choice ($n = 755$), $\gamma = .34$, $SE = .18$, $z = 1.85$, $p = .064$, conditions were more likely to have attended at least 85% classes. Specifically, in the no reward condition, only 44.87% students attended 85% classes, whereas 52.84% and 52.59% students met the attendance target in the personal choice and teacher choice conditions, respectively.

Prior Achievement Level

The NGO provided records of students' scores on tests taken before the interventions were implemented. These test scores reflected the prior achievement level of the students. The records were matched with the other data using a unique identifying number. We were able to match 916 student records.

ASSET Test: Persistence and Performance

The ASSET test aimed to assess knowledge in different domains, ranging from factual information and concept recognition to complex problem-solving and analytic skills. The test was administered by an independent testing authority. Teachers in the education centers were required to follow daily lesson plans strictly and did not have access to the test questions ahead of time; thus, they were unlikely to teach to the test. The test consisted of 60 multiple-choice questions. Exam administrators read aloud an exam question, asked students to circle the correct answer, and then moved on to the next question. Administrators unaffiliated with the NGO scored the exams. Students obtained one point for each question that they answered correctly. There was no penalty for incorrect answers.

Persistence measure. *Persistence* refers to interest in pursuing certain tasks to attain a desirable outcome (Kamins & Dweck, 1999). Depending on the specific contexts of prior studies, several different measures have been adopted to assess this construct, such as self-reported intention to continue to pursue a task (Cimpian, Arce, Markman, & Dweck, 2007; Mueller & Dweck, 1998), self-reported coping strategies and perseverance (Grant & Dweck, 2003; Rimfeld, Kovas, Dale, & Plomin, 2016), observations of the time and effort spent on a given task (Battle, 1965; Fishbach & Choi, 2012; Iyengar & Lepper, 1999; Park & Kim, 2015), the likelihood of switching to an alternate task (Park & Kim, 2015), and the willingness to pay to pursue an activity (Fishbach & Choi, 2012). All of these measures aim to assess personal interest in pursuing and completing a task. In the current study, all students were given the same amount of time to answer the questions. For each question on the test, they could choose to persist by trying to answer the question or to give up and skip those questions they found to be difficult. Therefore, we used the number of questions attempted by the students as a measure of their persistence.

Performance measure. The number of questions the students answered correctly was a measure of their performance. The

testing authority provided information about the nature of the skills that each question tested. Thus, the questions could be classified according to their difficulty level. There were 12 simple, 37 intermediate, and 11 complex questions. As we did not have specific predictions about whether and how mindset interventions, incentive structures, and prior achievement might interact to influence students' performance on questions at varying difficulty levels, we focus on the overall performance of the students in our main analyses. We then present exploratory analyses that examine the effects of mindsets, incentives, and prior achievement by difficulty level.

Results

Analysis Overview

As mentioned above, participants were assigned to one of the 2 (Mindset: Growth, or Control) × 3 (Reward: Personal Choice, Teacher Choice, or No Reward Control) interventions. Students within the same class were assigned to the same condition. Thus, individual students were nested within classes. We used a multilevel model to account for the nonindependence of observations. We first ran a two-level null model with ASSET test performance as the dependent variable. The result showed that 51.71% of the variance resided in between-classes. Therefore, we proceeded to conduct two-level random-coefficient modeling analyses.

We first test for differences in participants' prior performance across conditions before the mindset and reward interventions were implemented. Next, we examine the effects of the interventions and prior performance on the key dependent measure, the ASSET test performance. We then test for the mediating effect of persistence. Finally, we conclude with an exploratory analysis by difficulty level of the test questions. The analyses were conducted using the multilevel analyses packages in STATA 14.

Initial Differences

To examine whether the students across the experimental conditions differed in their prior test performance scores, we estimated a two-level model with mindset and reward conditions at Level 2, predicting prior performance. As shown in Table 3, none of the main or interaction effects of the interventions were significant. Thus, the students did not significantly differ across intervention conditions in terms of their prior achievement. We then examine the hypothesized cross-level interaction of Mindset × Reward × Prior Performance on ASSET test scores.

Intervention Effects on Performance

To examine the effect of mindset, reward, and prior performance on ASSET test scores, we estimated a two-level model with mindset and reward conditions at Level 2 and prior performance at Level 1 predicting ASSET test scores. The mindset conditions were dummy coded (mindset: 1 = growth and 0 = control). The reward conditions were also dummy coded using no reward control as the reference group (teacher choice: 1 = teacher choice, 0 = personal choice, 0 = no reward control; personal choice: 0 = teacher choice, 1 = personal choice, 0 = no reward control). As shown in Table 4A, the main effect of Prior Performance was significant, $\gamma = .36$, $p < .001$. The Mindset × Prior Performance effect was not significant, $\gamma = -.16$, $p = .13$. The significant three-way Mindset × Reward × Prior Performance interactions revealed that the growth mindset intervention interacted with personal choice and prior performance to influence ASSET performance, $\gamma = .39$, $p = .01$, but it did not interact with teacher choice and prior performance, $\gamma = .08$, $p = .60$. This result suggests that compared to students in the no reward control condition, the performance of those who were in the personal choice condition was influenced by the mindset interventions and their prior performance. In contrast, the pattern of effects found among those who were in the teacher choice condition did not differ significantly from students who were in the no reward control condition (see Figure 1 for comparisons). Simple slope analyses with prior performance centered at 1.5 *SD* above or below the mean (see Table 5) revealed that the Mindset × Personal Choice Reward interaction effect was significant when prior performance was high (+1.5 *SD*), $\gamma = 8.62$, $p = .04$, but not when prior performance was low (−1.5 *SD*), $\gamma = -2.98$, $p = .47$. The simple slope effects of the Mindset × Teacher Choice Reward interaction were not significant regardless of whether prior performance was high (+1.5 *SD*), $\gamma = 2.09$, $p = .62$, or low (−1.5 *SD*), $\gamma = -.17$, $p = .97$.

Furthermore, when the effects of reward and prior performance were examined by Mindset Condition separately (see Table 6), the results revealed that the Personal Choice Reward × Prior Performance interaction was significant in the growth mindset intervention, $\gamma = .21$, $p = .03$, but not in the control mindset condition,

Table 3
Initial Differences in Achievement Across Treatment Conditions

Dependent variable: Prior performance	Coefficient	*SE*	z	*p* value	95% confidence interval	
Level 1						
Intercept	43.45	1.56	27.81	.00	40.39	46.51
Level 2						
Mindset intervention						
Growth	.76	2.35	.32	.75	−3.84	5.36
Reward interventions						
Teacher choice	2.36	2.28	1.03	.30	−2.11	6.82
Personal choice	1.49	2.29	.65	.52	−3.00	5.97
Interactions						
Growth × Teacher choice	−1.64	3.39	−.48	.63	−8.28	5.00
Growth × Personal choice	−1.03	3.28	−.31	.75	−7.45	5.39

Table 4A
The Effects of Mindset, Reward, and Prior Performance on Assessment of Scholastic Skills Through Educational Testing (ASSET) Performance

Dependent variable: ASSET performance	Coefficient	*SE*	z	*p* value	95% confidence interval	
Level 1						
Intercept	28.73	1.65	17.39	.00	25.49	31.97
Prior performance	.36	.07	5.35	.00	.23	.49
Level 2						
Mindset intervention						
Growth	−1.20	2.48	−.49	.63	−6.07	3.66
Reward interventions						
Teacher choice	−.66	2.41	−.28	.78	−5.38	4.05
Personal choice	−2.74	2.41	−1.14	.26	−7.47	1.99
Interaction						
Growth × Teacher choice	.96	3.58	.27	.79	−6.06	7.98
Growth × Personal choice	2.82	3.46	.81	.42	−3.96	9.60
Cross-level interaction						
Growth × Prior performance	−.16	.10	−1.51	.13	−.36	.05
Reward × Prior performance						
Teacher choice × Prior performance	−.09	.10	−.87	.39	−.28	.11
Personal choice × Prior performance	−.18	.12	−1.52	.13	−.42	.05
Mindset × Reward × Prior performance						
Growth × Teacher choice × Prior performance	.08	.14	.52	.60	−.21	.36
Growth × Personal choice × Prior performance	.39	.16	2.50	.01	.08	.69

$\gamma = -.18$, $p = .14$. The teacher choice reward did not have significant effects in either condition, all ps $> .41$.

The Mediating Role of Persistence

Next, we examined the indirect effect of mindset, reward, and prior performance on ASSET test scores through persistence. As stated above, persistence was assessed by the number of questions the students attempted to answer. We first estimated a two-level model with mindset and reward conditions at Level 2 and prior performance at Level 1 predicting persistence (Table 4B). Then, we fitted the two-level model predicting ASSET test scores, with persistence as the mediator and estimated the indirect effects using 1,000 bootstrap replications (Table 4C). As shown in Table 4B, the main effect of prior performance was significant, $\gamma = .36$, $p < .001$. The two-way Mindset × Prior Performance interaction on persistence was significant, $\gamma = -.27$, $p = .04$. This effect was further qualified by a significant three-way Mindset × Reward ×

Table 4B
The Effects of Mindset, Reward, and Prior Performance on Persistence

Dependent variable: Persistence	Coefficient	*SE*	z	*p* value	95% confidence interval	
Level 1						
Intercept	55.24	.99	55.61	.00	53.29	57.19
Prior performance	.36	.08	4.29	.00	.19	.52
Level 2						
Mindset intervention						
Growth	1.50	1.50	1.00	.32	−1.43	4.44
Reward interventions						
Teacher choice	−1.56	1.45	−1.07	.28	−4.41	1.29
Personal choice	.99	1.47	.67	.50	−1.90	3.88
Interaction						
Growth × Teacher choice	1.37	2.16	.64	.53	−2.85	5.60
Growth × Personal choice	−1.23	2.10	−.59	.56	−5.35	2.88
Cross-level interaction						
Growth × Prior performance	−.27	.13	−2.08	.04	−.52	−.02
Reward × Prior performance						
Teacher choice × Prior performance	−.08	.13	−.67	.50	−.33	.16
Personal choice × Prior performance	−.40	.15	−2.71	.01	−.70	−.11
Mindset × Reward × Prior performance						
Growth × Teacher choice × Prior performance	.09	.18	.53	.60	−.26	.45
Growth × Personal choice × Prior performance	.55	.19	2.84	.00	.17	.93

Table 4C
The Indirect Effects of Mindset, Reward, and Prior Performance on Assessment of Scholastic Skills Through Educational Testing (ASSET) Performance Through Persistence

Dependent variable: ASSET performance	Coefficient	*SE*	z	*p* value	95% confidence interval	
Level 1						
Intercept	2.05	1.88	1.09	.28	−1.64	5.73
Prior performance	.19	.06	3.36	.00	.08	.29
Mediator						
Persistence	.49	.02	21.36	.00	.44	.53
Level 2						
Mindset intervention						
Growth	−2.15	2.11	−1.02	.31	−6.29	1.99
Reward interventions						
Teacher choice	−.29	2.05	−.14	.89	−4.31	3.73
Personal choice	−3.44	2.05	−1.67	.09	−7.46	.59
interaction						
Growth × Teacher choice	.69	3.05	.23	.82	−5.29	6.66
Growth × Personal choice	3.60	2.94	1.22	.22	−2.17	9.38
Cross-level interaction						
Growth × Prior performance	−.03	.08	−.31	.76	−.19	.14
Reward × Prior performance						
Teacher choice × Prior performance	−.05	.08	−.57	.57	−.21	.11
Personal choice × Prior performance	.01	.10	.15	.88	−.18	.21
Mindset × Reward × Prior performance						
Growth × Teacher choice × Prior performance	.03	.12	.25	.80	−.20	.26
Growth × Personal choice × Prior performance	.12	.13	.95	.34	−.13	.37
Indirect effect estimates (1,000 bootstraps)						
Growth × Teacher choice × Prior performance	.05	.11	.42	.68	−.17	.26
Growth × Personal choice × Prior performance	.27	.12	2.24	.03	.03	.50

Prior Performance interaction. Specifically, growth mindset interacted with personal choice and prior performance to influence persistence, $\gamma = .55$, $p < .001$, but not did not interact with teacher choice and prior performance, $\gamma = .09$, $p = .60$. As shown in Table 4C, persistence had a significant impact on ASSET performance, $\gamma = .49$, $p < .001$. The three-way Mindset × Personal Choice Reward × Prior Performance interaction was no longer significant, $\gamma = .12$, $p = .34$. The indirect effect of Mindset × Personal Choice Reward × Prior Performance on ASSET test scores through persistence was significant, $\gamma = .27$, $p = .03$, but the indirect effect of Mindset × Teacher Choice Reward × Prior Performance was not, $\gamma = .05$, $p = .68$.

To summarize, the growth mindset intervention intended to enhance future performance among underperforming students by emphasizing the importance of personal effort in learning and mastering knowledge. However, our results revealed that this intervention facilitated performance through persistence only when the incentive system was aligned with its core message, which emphasized autonomy. Furthermore, this facilitation effect only occurred among students with high prior achievement, but not among prior low performers. Although incentives chosen by teachers, who were important others to the students, should theoretically reinforce the goals of learning and mastery of knowledge by helping the students to internalize these goals, we did not find this effect. In fact, the patterns found in the no reward and teacher choice reward conditions were similar, and they were both significantly different from the personal choice conditions, in which individuals were imparted with a sense of autonomy (see Tables 7A, 7B, and 7C). When the intervention was implemented in the absence of autonomy, there was a trend—although not statistically significant—that learning about the growth mindset undermined the performance of those who showed high initial performance (see Table 7C).

These findings suggest that the growth mindset intervention enhanced performance through increased persistence; however, this effect occurred for high performing students, and only when the mindset intervention was accompanied with a sense of personal control and autonomy.

Exploratory Analyses by Question Type

As mentioned, the questions on the ASSET examination can be categorized as simple, intermediate, or complex. We conducted exploratory analyses to examine the interactive effects of mindset, incentives, and prior achievement on performance by each difficulty level separately. As shown in Tables 8A, 8B, and 8C, the three-way Mindset × Personal Choice Reward × Prior Performance interaction was significant only for the intermediate questions, $\gamma = .29$, $p = .01$, but not for the simple and complex questions, $\gamma = .04$, $p = .40$ and $\gamma = .06$, $p = .11$, respectively. The specific pattern of effects for the intermediate questions was similar to that of the total test score depicted in Figure 1. These results show that the intervention effects observed were mainly driven by questions with an intermediate level of difficulty. Evidently, although our growth mindset and reward interventions influenced performance through persistence, they were mainly effective when the task was moderately

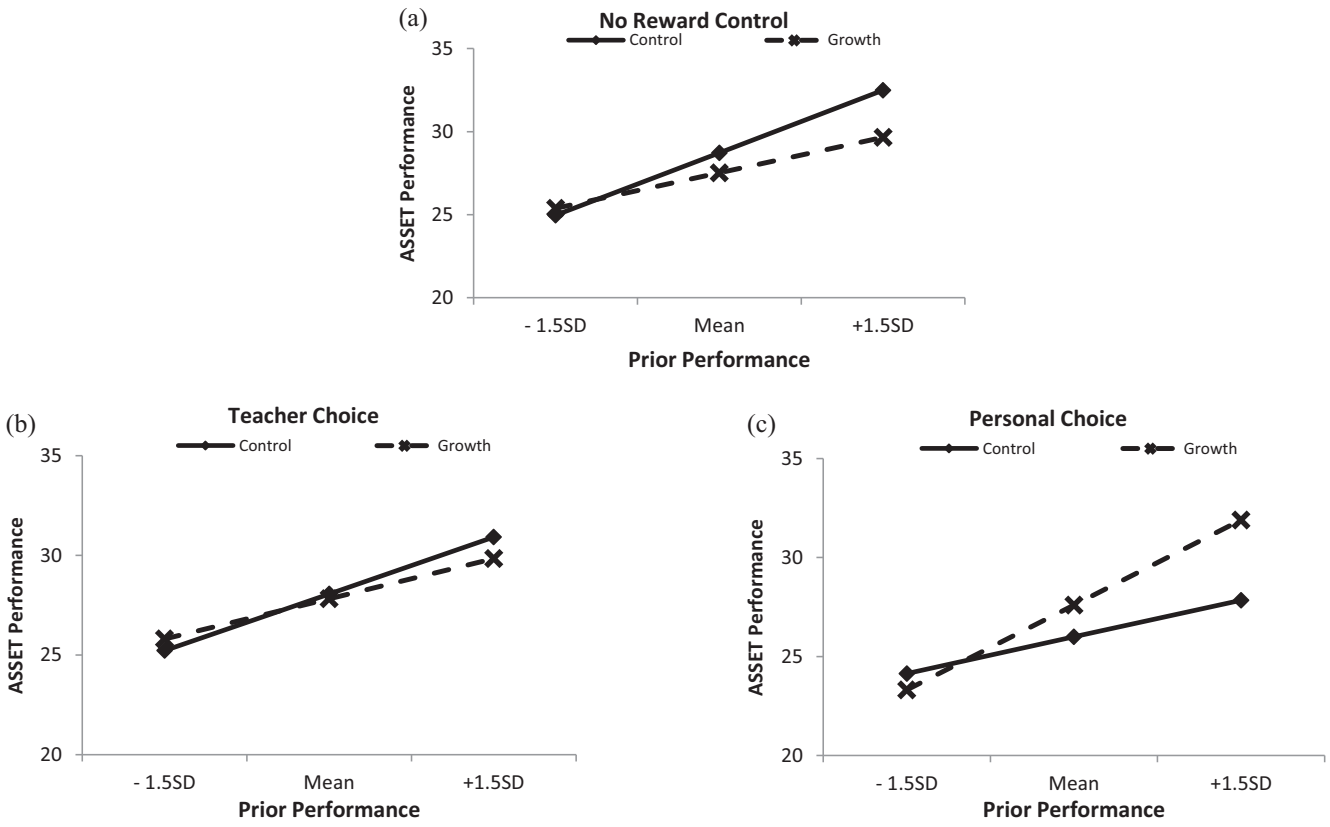

Figure 1. The effect of mindset conditions (growth vs. control) and prior performance on Assessment of Scholastic Skills Through Educational Testing (ASSET) test score by reward conditions: (a) no reward control, (b) teacher choice, and (c) personal choice.

challenging; the effects were not evident for tasks that were either too difficult or too easy.

Discussion

This research brings together different subfields of psychology to shed light on a key question about the effectiveness of psychological interventions and the resulting implications for global policy in global educational settings. Our study recognizes the universality of the psychological processes (Bennis & Medin, 2010; Danks & Rose, 2010) involved in the mindset intervention, and at the same time acknowledges that there is considerable variation in self-concepts, motivation, and behavior across different social and cultural contexts (Kesebir et al.,

Table 5
Simple Slope Estimates of the Effects of Mindset, Reward, and Prior Performance on Assessment of Scholastic Skills Through Educational Testing Performance

		Mindset conditions					
		Control mindset			Growth mindset		
Reward conditions	Prior performance	Estimates	95% confidence interval		Estimates	95% confidence interval	
No reward control	+1.5 *SD*	32.48	28.93	36.03	29.66	25.66	33.66
	M	28.73	25.45	32.00	27.53	23.86	31.19
	−1.5 *SD*	24.97	21.42	28.52	25.39	21.39	29.39
Teacher choice	+1.5 *SD*	30.92	27.12	34.71	29.83	25.82	33.85
	M	28.07	24.60	31.54	27.82	24.05	31.59
	−1.5 *SD*	25.22	21.43	29.02	25.81	21.79	29.82
Personal choice	+1.5 *SD*	27.85	23.82	31.88	31.90	28.39	35.40
	M	25.99	22.51	29.48	27.60	24.34	30.87
	−1.5 *SD*	24.13	20.11	28.16	23.31	19.80	26.82

Table 6
The Effects of Reward, and Prior Performance on Assessment of Scholastic Skills Through Educational Testing (ASSET) Performance by Mindset

Dependent variable: ASSET performance	Coefficient	*SE*	z	*p* value	95% confidence interval	
Growth mindset conditions						
Level 1						
Intercept	27.53	1.81	15.19	.00	23.98	31.08
Prior performance	.20	.07	2.75	.01	.06	.35
Level 2						
Reward interventions						
Teacher choice	.29	2.60	.11	.91	−4.80	5.39
Personal choice	.08	2.43	.03	.97	−4.68	4.84
Cross-level interaction						
Reward × Prior performance						
Teacher choice × Prior performance	−.01	.10	−.12	.91	−.21	.18
Personal choice × Prior performance	.21	.10	2.18	.03	.02	.39
Control mindset condition						
Level 1						
Intercept	28.73	1.72	16.75	.00	25.37	32.09
Prior performance	.36	.07	5.14	.00	.22	.50
Level 2						
Reward Interventions						
Teacher choice	−.67	2.50	−.27	.79	−5.56	4.23
Personal choice	−2.74	2.51	−1.09	.27	−7.65	2.17
Cross-level Interaction						
Reward × Prior performance						
Teacher choice × Prior performance	−.09	.11	−.83	.41	−.29	.12
Personal choice × Prior performance	−.18	.12	−1.46	.14	−.43	.06

2010; Khemlani et al., 2010; Rai & Fiske, 2010). The findings suggest that scholars and policymakers should be cautious when implementing growth mindset interventions in developing regions. They should carefully consider the unspoken assumptions in the social environment that might have facilitated growth mindset intervention effectiveness in previous studies (e.g., the experience of autonomy) and should take the immediate social cultural constraints into consideration.

Theoretical Implications

The growth mindset intervention is based on a motivational model of achievement (e.g., Dweck & Leggett, 1988). The model posits that individuals who endorse growth mindsets more strongly believe that their ability is malleable and that they can enhance their performance outcomes through learning and mastering knowledge; hence, they are motivated to take up challenges and to persist in the face of setback.

Table 7A
The Effects of Mindset, Reward (No Reward Control vs. Personal Choice), and Prior Performance on Assessment of Scholastic Skills Through Educational Testing Performance

No reward control vs. personal choice	Coefficient	*SE*	z	*P* value	95% confidence interval	
Level 1						
Intercept	28.76	1.55	18.61	.00	25.73	31.79
Prior performance	.36	.07	5.12	.00	.22	.50
Level 2						
Mindset intervention						
Growth	−1.24	2.32	−.53	.60	−5.78	3.31
Reward interventions						
Personal choice	−2.77	2.26	−1.23	.22	−7.20	1.66
Interaction						
Growth × Personal choice	2.84	3.24	.88	.38	−3.50	9.19
Cross-level interaction						
Growth × Prior performance	−.16	.11	−1.44	.15	−.37	.06
Reward × Prior performance						
Personal choice × Prior performance	−.18	.13	−1.46	.15	−.43	.06
Mindset × Reward × Prior performance						
Growth × Personal choice × Prior performance	.39	.16	2.39	.02	.07	.71

Table 7B
The Effects of Mindset, Reward (Teacher Choice vs. Personal Choice), and Prior Performance on Assessment of Scholastic Skills Through Educational Testing Performance

Teacher choice vs. personal choice	Coefficient	*SE*	z	*p* value	95% confidence interval	
Level 1						
Intercept	28.03	1.64	17.07	.00	24.81	31.25
Prior performance	.27	.08	3.49	.00	.12	.43
Level 2						
Mindset intervention						
Growth	−.22	2.42	−.09	.93	−4.97	4.52
Reward interventions						
Personal choice	−2.04	2.33	−.88	.38	−6.60	2.53
Interaction						
Growth × Personal choice	1.83	3.31	.55	.58	−4.66	8.33
Cross-level interaction						
Growth × Prior performance	−.08	.11	−.75	.45	−.29	.13
Reward × Prior performance						
Personal choice × Prior performance	−.09	.13	−.73	.46	−.35	.16
Mindset × Reward × Prior performance						
Growth × Personal choice × Prior performance	.31	.16	1.95	.05	.00	.63

The model also suggests that the intervention should be the most effective at motivating students who underperformed. Previous studies that have mainly been conducted in American contexts have provided consistent support to the effectiveness of the growth mindset intervention (Blackwell et al., 2007; Paunesku et al., 2015; Yeager, Romero, et al., 2016). Drawing from the extant literature (Rattan et al., 2015), which suggests that incentivizing hard work can promote the effectiveness of the growth mindset, one would also predict that the provision of reward would boost the effectiveness of the mindset intervention further. Specifically, compared with no incentive system (no reward control), an incentive system that aligned with the core message of the mindset intervention about personal control and hard work (personal choice) or an incentive system that helped students internalize the importance of hard work through important others (teacher choice) should boost the effectiveness of the mindset intervention.

Findings from the current study conducted in Indian slums provide qualified support for the existing theoretical framework. They reveal that the growth mindset intervention does not inherently promote positive achievement outcomes. Specifically, the growth mindset intervention did facilitate performance through persistence, but only when the incentive system imparted individuals with a sense of autonomy. In addition, this facilitation effect was only found among students with high prior achievement, but not among those who underperformed. When the incentives were given by teachers, important others to the students, the pattern of findings was similar to that found among students who were not offered any reward. That is, when the incentive was given by teachers, it does not appear to have

Table 7C
The Effects of Mindset, Reward (No Reward Control vs. Teacher Choice), and Prior Performance on Assessment of Scholastic Skills Through Educational Testing Performance

No reward control vs. teacher choice	Coefficient	*SE*	z	*p* value	95% confidence interval	
Level 1						
Intercept	28.68	1.86	15.43	.00	25.04	32.33
Prior performance	.36	.06	5.89	.00	.24	.48
Level 2						
Mindset intervention						
Growth	−1.16	2.79	−.41	.68	−6.62	4.31
Reward interventions						
Teacher choice	−.56	2.70	−.21	.84	−5.86	4.74
Interaction						
Growth × Teacher choice	.87	4.03	.22	.83	−7.02	8.77
Cross-level interaction						
Growth × Prior performance	−.16	.09	−1.66	.10	−.34	.03
Reward × Prior performance						
Teacher choice × Prior performance	−.09	.09	−.95	.34	−.27	.09
Mindset × Reward × Prior performance						
Growth × Teacher choice × Prior performance	.08	.13	.58	.56	−.18	.33

Table 8A
The Effects of Mindset, Reward, and Prior Performance on Assessment of Scholastic Skills Through Educational Testing Simple Question Performance

Dependent variable: Simple question performance	Coefficient	*SE*	z	*p* value	95% confidence interval	
Level 1						
Intercept	6.56	.39	16.76	.00	5.79	7.33
Prior performance	.07	.02	3.46	.00	.03	.11
Level 2						
Mindset intervention						
Growth	−.19	.59	−.32	.75	−1.34	.97
Reward Interventions						
Teacher choice	.18	.57	.32	.75	−.93	1.30
Personal choice	−.52	.57	−.90	.37	−1.64	.61
Interaction						
Growth × Teacher choice	−.12	.85	−.14	.89	−1.78	1.55
Growth × Personal choice	.47	.82	.57	.57	−1.14	2.08
Cross-level interaction						
Growth × Prior performance	.00	.03	−.13	.89	−.06	.06
Reward × Prior performance						
Teacher choice × Prior performance	.01	.03	.38	.70	−.05	.07
Personal choice × Prior performance	−.03	.04	−.78	.44	−.10	.04
Mindset × Reward × Prior performance						
Growth × Teacher choice × Prior performance	−.04	.04	−1.03	.30	−.13	.04
Growth × Personal choice × Prior performance	.04	.05	.84	.40	−.05	.13

helped the students internalize the growth mindset more than they already had. This might be because internalizing any guidance given by authority figures was a default among these students. Thus, incentives given by teachers added little to enhance their internalization process. It is also important to note that the mindset intervention showed little impact on the performance of those who underperformed. In addition, when the intervention was implemented in the absence of an incentive system or in the absence of an incentive system that imparted students with a sense of autonomy (i.e., no reward control and teacher choice conditions), the growth mindset showed a trend of undermining the performance of those who had high initial achievement.

The existing growth mindset theoretical framework cannot fully account for the observed effects. The findings suggest that rather than responding positively to the growth mindset intervention uniformly, individuals play an active role in interpreting their

Table 8B
The Effects of Mindset, Reward, and Prior Performance on Assessment of Scholastic Skills Through Educational Testing Intermediate Question Performance

Dependent variable: Complex question performance	Coefficient	*SE*	z	*p* value	95% confidence interval	
Level 1						
Intercept	18.03	1.00	18.00	.00	16.06	19.99
Prior performance	.26	.04	5.83	.00	.17	.35
Level 2						
Mindset intervention						
Growth	−1.24	1.50	−.82	.41	−4.19	1.71
Reward Interventions						
Teacher choice	−1.11	1.46	−.76	.45	−3.97	1.75
Personal choice	−1.33	1.46	−.91	.36	−4.20	1.54
Interaction						
Growth × Teacher choice	1.60	2.17	.74	.46	−2.65	5.86
Growth × Personal choice	1.58	2.10	.75	.45	−2.53	5.69
Cross-level interaction						
Growth × Prior performance	−.13	.07	−1.83	.07	−.26	.01
Reward × Prior performance						
Teacher choice × Prior performance	−.11	.07	−1.61	.11	−.24	.02
Personal choice × Prior performance	−.14	.08	−1.76	.08	−.30	.02
Mindset × Reward × Prior performance						
Growth × Teacher choice × Prior performance	.11	.10	1.17	.24	−.08	.30
Growth × Personal choice × Prior performance	.29	.10	2.74	.01	.08	.49

Table 8C
The Effects of Mindset, Reward, and Prior Performance on Assessment of Scholastic Skills Through Educational Testing Intermediate Question Performance

Dependent variable: Complex question performance	Coefficient	*SE*	z	*p* value	95% confidence interval	
Level 1						
Intercept	4.18	.37	11.17	.00	3.45	4.92
Prior performance	.03	.02	1.66	.10	−.01	.06
Level 2						
Mindset intervention						
Growth	.18	.56	.32	.75	−.92	1.28
Reward Interventions						
Teacher choice	.17	.55	.32	.75	−.90	1.24
Personal choice	−.93	.55	−1.69	.09	−2.00	.15
Interaction						
Growth × Teacher choice	−.45	.81	−.56	.58	−2.05	1.14
Growth × Personal choice	.80	.78	1.02	.31	−.74	2.34
Cross-level interaction						
Growth × Prior performance	−.03	.03	−.98	.33	−.08	.03
Reward × Prior performance						
Teacher choice × Prior performance	.01	.03	.37	.71	−.04	.06
Personal choice × Prior performance	−.01	.03	−.44	.66	−.07	.05
Mindset × Reward × Prior performance						
Growth × Teacher choice × Prior performance	.01	.04	.21	.84	−.06	.08
Growth × Personal choice × Prior performance	.06	.04	1.62	.11	−.01	.14

experiences. This idea is consistent with the identity-based motivation theory (Oyserman, 2007, 2009a, 2009b), which states that individuals make sense of their experiences in ways that are consistent with their understanding of their identity. When an action is identity-congruent, individuals are likely to interpret setbacks as important challenges that they need to overcome to attain desirable outcomes. Their positive effort-to-outcome expectancy motivates them to persist in the face of difficulties. When an action is identity-incongruent, however, individuals can become demotivated because they interpret difficulties as indicative of a poor chance of attaining desirable outcomes. Although identities of the students, their interpretations of experienced difficulty, and their performance expectation were not assessed in the current study, we speculate that these are important factors that have been overlooked in the existing growth mindset intervention. These factors should be taken into consideration when conducting future research and intervention in light of our findings.

Although numerous steps have been taken to promote inclusiveness (Government of India, Planning Commission, 2011) and equity (Government of India, Ministry of Human Resource Development, 2014) in India, social inequality still exists and stigma against disadvantaged groups continues to perpetuate. In this social environment, external constraints or factors that influence the actions and personal outcomes (e.g., academic achievement) of individuals become highly salient. Thus, by default, individuals tend to interpret their ability and its associated outcomes as fixed entities due mainly to environmental constraints, not due to the lack of personal effort. The growth mindset intervention suggests that personal effort matters and individuals are in control of their own outcomes. This message might generally be identity-incongruent, for both low- and high-achievers in a society in which external constraints are highly salient.

Low-achieving students growing up in slums are a disadvantaged group among the disadvantaged. Their sense of helplessness can be dominant and it could be self-comforting for them to attribute their poor position to external constraints. The growth mindset message about changing and controlling their personal outcome might be at odds with their sense of helplessness and their understanding of the self; it is possible that any challenges and difficulties are interpreted as impossibilities that are out of their reach. This idea is consistent with previous research showing that individuals who perceive limited upward mobility experience a sense of powerlessness, and tend to adhere to, reinforce, and defend the status quo, even when their beliefs are challenged (Laurin, Shepherd, & Kay, 2010; van der Toorn et al., 2015).

In contrast, high-achieving students living in slums may be a relatively advantaged group among their peers. They might attribute their initial success to external environmental factors that happen to work in their favor. The growth mindset intervention, which suggests that their success is due to their personal effort and control, might be incongruent with their understanding of both the self and the impact of environmental constraints on the self in general. As reflected in the findings in the no reward control and teacher choice conditions, these high-achieving students might perceive enhancing achievement through personal effort and hard work as impossibilities and show an inclination to disengage from academic pursuits when given a growth mindset intervention where the sense of autonomy is absent. However, an incentive system that suggests to them that autonomy is a possibility in the given environment is congruent with the growth mindset message about self-control and hard work, and thus, leads to more positive outcomes. In retrospect, in this Indian slum's context, the responses of high-achieving students who were given an incentive system that emphasized autonomy are consistent with the growth mindset framework, which has mainly been developed and tested in the American context, in which self-determination is often an assumed social default that guides decisions and behaviors.

Taken together, these findings suggest that individuals play an active role in making sense of their self and the environment. The results suggest that there is no inherent relationship between the growth mindset and achievement outcomes. Rather than responding to the growth mindset message favorably and uniformly, students are motivated to excel to the extent that the message of personal effort and control is consistent with their understanding of the self and are afforded by their environment; however, they tend to become disengaged when they experience inconsistencies in their sense-making process. Instead of providing definitive evidence for or against the growth mindset interventions, the current study paves the way for further exploration and to advance future research. It suggests that the effectiveness of the growth mindset intervention might hinge on the extent to which the incentive structure in the immediate social environment allows for personal volition and control. It also reveals that individuals actively and dynamically interpret their experiences in a given context.

The current study cuts across multiple subfields of psychology by bringing together the growth mindset intervention with the study of incentive structures to test the generalizability and the boundary conditions of psychological interventions in an educational setting in a developing region, which is a key context targeted in recent global policy intervention initiatives (e.g., World Bank, 2015; World Development Report, 2015). Recognizing the universality of psychological processes and at the same time taking contextual influences into consideration, the current study helps advance theories on early psychological interventions in educational settings. It helps refine evidence-based intervention designs that aim to promote well-being of people across different societies.

Limitations

Although this study advances research on academic achievement and provides insights for practice, it has a few limitations. First, the ASSET scores were only available for a random sample of students from each classroom because of budgetary constraints. A more comprehensive analysis would be based on the test scores of all students. It is often challenging to conduct field experiments, particularly in developing regions as resources are often not readily accessible. We hope that the findings of this study can pave the way for future studies and highlight the importance of investigating the impact of psychological interventions, which are mostly tested and established in developed regions, on underserved populations in developing regions.

Second, the research team worked with the NGO administrative team to identify student attendance as the appropriate incentive target to signal the importance of learning and knowledge mastery. This was done to reinforce the core tenet of the growth mindset intervention. We did not investigate the impact of rewarding test performance, which is the key dependent measure in this and other mindset intervention studies (e.g., Blackwell et al., 2007). Would the effect of incentivizing test performance be different from incentivizing attendance? Depending on how the rewards were administered, external rewards could enhance or undermine motivation (Deci, 1971; Eisenberger & Rhoades, 2001; Lepper et al., 1973). According to the growth mindset literature, incentivizing test performance might undermine the effect of the growth mindset because the goal to perform well to demonstrate competence might be at odds with the goal to learn and to master knowledge (see Dweck & Leggett, 1988; Elliott & Dweck, 1988). We suspect that when test performance, instead of attendance, is incentivized, it might undermine the intrinsic motivation to learn, because the reward would direct the attention of the students to a one-shot performance outcome to demonstrate their ability, rather than to the learning processes that unfold over time. This might lead students to perceive their behavior to be driven primarily by the extrinsic reward and undermine their intrinsic motivation (see Amabile et al., 1986). Whether incentivizing the learning process (e.g., attendance) or the final achievement outcome (e.g., test performance) would exert differential effects on growth mindset intervention is an empirical question that awaits testing. However, as existing literature suggests that incentivizing test performance might have negative implications, future studies that examine the potential impact of incentivizing test performance should do so cautiously and consider when incentivizing performance might result in positive or negative outcomes.

Third, we acknowledge a confounding factor between the two reward conditions (teacher choice and personal choice) versus the no reward condition (no reward control). In the two reward conditions, in addition to getting incentives, the importance of attendance was also emphasized. In the no reward condition, there were no incentives and no emphasis on attendance. Although a better control would have emphasized the importance of attendance without providing any incentive, the current no reward control condition was used to examine the pure effect of the growth mindset intervention among disadvantaged groups in developing regions. Our findings suggest that the effect of the control condition used in the current study (no reward and no emphasis on attendance) might be similar to a control condition in which only attendance was emphasized. This is because the pattern of results among students in the no reward control condition was similar to those in the teacher choice condition. They were both significantly different from the personal choice condition, in which individuals were imparted with a sense of autonomy. This suggests that it is the sense of autonomy, not public emphasis of attendance nor the provision of incentives that influenced the outcomes. Future research could disentangle this potential confounding effect.

Finally, although identity-based motivation theory (Oyserman, 2007, 2009a, 2009b) might better account for the results of this study conceptually, the core constructs of this theory (e.g., identities of the students, their interpretations of experienced difficulty, and their expectations regarding performance) were not assessed. These might be important factors that have been overlooked in the existing growth mindset literature and should be taken into consideration when conducting future research and intervention in light of our findings.

Policy Implications

Existing policy recommendations about growth mindset interventions (e.g., GINI, World Bank, 2015; World Development Report, 2015) have been based almost exclusively on research showing that growth mindset interventions are effective among Western, educated, industrialized, rich, and democratic populations (see Henrich et al., 2010). These interventions have been found to be highly effective in both lab and field settings but have not been sufficiently examined in diverse contexts (Paunesku et al., 2015; also see Kesebir et al., 2010). The current study exam-

ined the possible impact of implementing such recommendations in the sort of population that is most vulnerable and is likely to be a prime target for global policy interventions. We identified boundary conditions under which mindset interventions might be effective, and when they might backfire. Findings from this field experiment suggest that when implementing growth mindset interventions, it is important to be sensitive to situational factors (e.g., incentive systems) and personal attributes (e.g., initial performance level) that might influence individuals' sense of self and their interpretations of the message embedded in the growth mindset. When implementing psychological interventions, policymakers should be aware that although belief in change can bring about a sense of hope and social mobility for some, it might well be threatening and demotivating for others. Furthermore, the growth mindset and incentive interventions in this and other studies tend to focus on enhancing individuals' motivation to learn and to perform. When designing interventions for the disadvantaged groups, besides focusing on shaping the achievement mindset of the individuals, policymakers should also be sensitive to the actual external constraints and hardships that might have limited the ability of the individuals to excel. That is, the performance of these disadvantaged groups might not only signify their motivation and effort investment (or the lack thereof) but might also reflect larger personal, social, and structural constraints, such as cross-generational poverty, the lack of family or social support, and the need for special education. Hence, researchers and policymakers should be particularly cautious when transferring psychological interventions across different populations, where concerns about interactions with background factors loom large.

Context of the Research

When we first designed this study, our goal was to identify strategies that could help improve the educational outcomes of children in Indian slum areas. We were inspired by the literature on the growth mindset (Blackwell et al., 2007; Dweck & Leggett, 1988; Elliott & Dweck, 1988). Thus, we worked with an NGO that operates education centers in slum areas in western India to introduce changes to their curriculum. Based on the growth mindset theory, our initial hypotheses anticipated positive outcomes, particularly for low achieving students. Some of the findings of the study are surprising and suggest that the existing growth mindset theoretical framework cannot fully account for the specific effects observed. This led us to consider alternative perspectives (e.g., identity-based motivation framework; Oyserman & Destin, 2010) that might help account for the observed effects. We hope that this study can pave the way for further exploration to identify factors that might facilitate or hinder the effectiveness of the growth mindset interventions in developing countries, which are the prime targets for global policy interventions. We also hope that this study will inspire future research that aims to enhance academic achievement of disadvantaged students.

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Call for Nominations

The Publications and Communications (P&C) Board of the American Psychological Association has opened nominations for the editorships of the *Journal of Experimental Psychology: Animal Learning and Cognition, Neuropsychology,* and *Psychological Methods* for the years 2020 to 2025. Ralph R. Miller, PhD, Gregory G. Brown, PhD, and Lisa L. Harlow, PhD, respectively, are the incumbent editors.

Candidates should be members of APA and should be available to start receiving manuscripts in early 2019 to prepare for issues published in 2020. Please note that the P&C Board encourages participation by members of underrepresented groups in the publication process and would particularly welcome such nominees. Self-nominations are also encouraged.

Search chairs have been appointed as follows:

- *Journal of Experimental Psychology: Animal Learning and Cognition*, Chair: Stevan E. Hobfoll, PhD
- *Neuropsychology,* Chair: Stephen M. Rao, PhD
- *Psychological Methods,* Chair: Mark B. Sobell, PhD

Candidates should be nominated by accessing APA's EditorQuest site on the Web. Using your browser, go to https://editorquest.apa.org. On the Home menu on the left, find "Guests/Supporters." Next, click on the link "Submit a Nomination," enter your nominee's information, and click "Submit."

Prepared statements of one page or less in support of a nominee can also be submitted by e-mail to Sarah Wiederkehr, P&C Board Editor Search Liaison, at swiederkehr@apa.org.

Deadline for accepting nominations is Monday, January 8, 2018, after which phase one vetting will begin.