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Understanding the Motivational Consequences of Extreme School Violence through the Lens of Mortality Salience: The Case of Academic Self-Stereotyping in Math

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Understanding the motivational consequences of extreme school violence through the lens of mortality salience: the case of academic self-stereotyping in math

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Abstract We conducted an investigation into a determinant of academic motivation that has implications for how we respond to school violence and tragedy. We conducted two studies to examine whether exposure to messages related to the salience of one's own mortality cause people to align their own academic beliefs more closely with stereotypical beliefs about their social groups. When exposed to graffiti images that contained messages such as R.I.P. (i.e., rest in peace), males and females in Study 1 expressed math attitudes that resembled the American stereotype of male superiority and female inferiority in this domain. In Study 2, writing about death caused participants to express ethnic stereotype-consistent math attitudes. As one example, our studies highlight a potential psychological barrier associated with student advancement in STEM careers (Science, Technology, Engineering, and Mathematics). These findings indicate that death reminders, even when they do not follow from direct exposure to school trauma, may impact the academic motivation of stereotypically disadvantaged groups. With the larger goal of reducing psychological barriers associated with inequality in the pursuit of STEM career pathways, these studies are intended to spur further examination of how cases of extreme violence in schools potentially can affect patterns of academic motivation. Even in its early stages, this research should provide new considerations for educational policy-makers aiming to design damage control protocols in response to extreme school violence.

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1 Introduction

Schools can be violent places. For instance, nearly 40 % of U.S. schools reported incidents of violence to police during 2005–2006 (National Center for Education Statistics 2009). From 2006 to 2007, nearly 8 % of 9–12th U.S. graders reported being threatened or injured with a weapon on school property (Centers for Disease Control and Prevention 2008b). Between 1999 and 2006, more than 16 students per year have been murdered in U.S. schools (Centers for Disease Control and Prevention 2008a). School violence affects children and adolescents worldwide. For instance, in the last 5 years, a partial list of deadly school shootings includes Azerbaijan (Associated Press 2009). Finland (Kauhajoki 2008), Germany (BBC News 2009a), Brazil (Fick and Lyons 2011), India (Reuters 2007), Israel (Erlanger and Kershner 2008), Greece (BBC News 2009b), and Hungary (Reuters 2009).

These calamitous events reflect the most extreme type of school violence, which is widespread, even in this extreme form. It is likely that for every recorded incidence of killing on school property, there are perhaps many additional incidents of violence that do not rise to the level of international reporting. The many cases of such violence have led to educational administrators' decisions to increase monitoring of student risk factors associated with violent acts (Anderson et al. 2001), increase safety standards and practices for combating school violence (Ellis 2003), and increase mental health services available to students in times of stress and crisis (Brener et al. 2007). Managing the impact of school tragedies is important not only because of the negative media attention these events attract, but more importantly, because these events are likely to affect the learning process of students in the schools where these tragedies occur.

It comes as no surprise that, when responding to school violence, policies are based on disrupting the harmful psychological and scholastic impacts that administrators expect such tragedies to have on students. Although existing approaches are designed to help students cope with school trauma, these approaches commonly do not consider how violence may impact academic interest and motivation, beyond attempting to control trauma-related anxiety and depression-related impairments. Because violence is a kind of aggression that implies extreme harm to its victims (e.g. the Federal Bureau of Investigation (FBI) defines violent crimes as comprising murder/non-negligent manslaughter, forcible rape, robbery, and aggravated assault; FBI 2010) exposure to, and reminders of, violence constitute a separate class of stressor than do many of the other antisocial behaviors that might be observed in school, such as theft or willful ostracism. In this manuscript, we seek to bring an important issue to the attention of the research community regarding the motivational consequences of school violence. These consequences go beyond the effects of trauma-triggered anxiety and mood disorders. This issue has implications not only for the survivors of school attacks and neighborhood violence, but also for other students who learn of deadly assaults, possibly even for those who learn of tragedy through exposure to a well-intentioned memorial.

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The primary aim of this manuscript is to instigate further examination of the impacts of life-threatening, and sometimes deadly, school violence on academics in terms of underlying mechanisms, as well as solutions for mitigating any potentially deleterious effects. To this end, we have conducted some initial studies in the domain of mathematics—an academic content area of high national concern within the United States. We have chosen the domain of mathematics both because of its importance for scientific advancement in general, and because of wide-spread stereotypes about the relative mathematics ability of different ethnic and gender groups. As we will explain, these two factors combine to make the effects of extreme violence on math motivation particularly important.

1.1 Academic values and stereotype-consistent achievement behavior

In 2009, the United States Congress passed the American Recovery and Reinvestment Act; a legislation whose aims included an increased commitment to innovation and advancement by way of education and research in science and mathematics. In his address to the National Academies of Sciences, President Obama (2011) discussed the area of science, technology, engineering, and mathematics (STEM) as "more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been" (para 10). Efforts to improve public literacy in STEM, as well as efforts to increase the number of students from diverse backgrounds pursuing STEM careers, remain important components of creating a stronger scientific workforce.

Increasing students' perceptions of STEM fields as viable career paths involves a consideration of the value students place on learning and achieving in STEM domains, including mathematics. This idea is seen in established frameworks of academic motivation and career choice (Eccles et al. 1983). Eccles and Wigfield (1995) discuss value in terms of its sub-components. *Attainment value* is the importance a student places on engaging in an academic task. In mathematics, for example, a student is likely to engage in learning about this subject to the extent that success in math is personally-relevant and self-validating. *Intrinsic value* is how naturally appealing an academic subject is to an individual. *Utility value* is the degree to which an academic subject is instrumental in terms of helping a student reach distal goals. For example, a student is likely to take learning about linear algebra seriously if she or he believes this knowledge will be useful in real-life situations. *Cost* is the consideration of what a student must sacrifice in order to engage in the academic subject. For example, the time it takes to learn statistics could be spent on other activities, such as sports or spending time with friends and family. This aspect of task value is negatively associated with engagement in the sense that a student is less likely to invest her or his effort in a task when the costs of doing so are great.

Research shows that when students value an academic task, they will engage in the activity even when they are not required to do so (Anderman and Wolters 2006; Wigfield and Eccles 1992). Task value is associated positively with future course enrollment—that is, the more a student values a particular subject, the more likely a student will choose to enroll in a course about the particular subject (Updegraff et al. 1996). Within the United States, for example, Asian students not only express

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greater intentions to major in STEM disciplines than do other ethnicities; Asian students also remain more committed to these majors to complete their STEM degrees within a 5 year period (Chang et al. 2010). Understanding the way students' value systems are constructed may prove useful for increasing participation in STEM academic disciplines—typified as being populated disproportionately by Asians and by males.

1.1.1 Social identity and motivation

Scholars such as Eccles (2009) and Oyserman (2009) argue that social identities play an important role in the construction of students' value systems. Identifying with a group means placing importance on, and defining oneself, in terms of one's membership in a group (e.g., gender group, racial group, social class, etc. Tajfel 1981; Tajfel and Turner 1979). Social identities are important for a student's academic values, in particular, because social identities "define what one should do with one's life to be successful in that role" (Eccles, p. 86). Research has shown, for example, that we learn about stereotypical gender roles at a young age (Ruble and Martin 1998). Further, the more we perceive being "female" or "male" as important to our sense of self, the more we embrace the norms, standards, cultural mores, and values of our cherished social categories as our own. In other words, we come to see the world, and the meaning of our own behavior, through the lens of being a female or male. In turn, these perceptions can perpetuate gender stereotype-consistent values in academic achievement behavior and career choice (Eccles 2009).

In order to better understand social identification effects, we must consider the social "triggers" responsible for activating social identities and stereotype-consistent academic values. Wigfield and Eccles (2002) argue that "it is difficult if not impossible to understand students' motivation without understanding the contexts they are experiencing" (p.128). Specifically, we seek to highlight how everyday exposure to information making mortality salient can trigger stereotype-consistent valuing in mathematics. Previous research, as we explain below, shows that mortality salience can increase social identification, with implications for the effects of identity-related stereotypes on our behavior.

1.2 Mortality salience

Our argument emanates from Terror Management Theory (Greenberg et al. 1986; Solomon et al. 2004). This theory describes how we come to rely on psychological defense structures when we are reminded, for instance, by violence or other stimuli that make mortality salient, that our physical existence on earth is temporary (Greenberg et al. 1986). Terror management theory holds that thinking and behaving in ways that are consistent with our cultural standards, norms, and values assures us that we are living a meaningful life. According to the theory, this assurance of a meaningful life helps us ward off concerns of death—symbolically transcending the corporal self, and thereby reducing death anxiety (Greenberg et al. 1997). Thus, certain thought and behavioral patterns help us curb death anxiety (Solomon et al. 1994). Approximately 300 studies indicate, for example, that when mortality is made salient, people show

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greater conviction in their cultural standards and derogate representatives of opposing worldviews (Burke et al. 2010; Greenberg et al. 1986). Other mortality salience effects include increased ethnocentrism, less favorable attitudes toward out-group members, and harsher judgments of individuals who violate cultural standards (for narrative reviews, see Greenberg et al. 1997 and (Pyszczynski et al. 2003). Peer-reviewed journals report mortality salience effects in samples from the U.S., Canada, Australia, Scotland, Italy, Holland, Israel, Germany, Switzerland, Japan, Hong Kong, Austria, New Zeeland, Costa Rica, Iran, England, Poland, Spain, and China (Burke et al. 2010). These effects have been observed across many different situational and cultural contexts.

Many elements of the academic environment can work to increase mortality salience. Beyond mass shootings (e.g., Columbine High School, Virginia Polytechnic Institute and State University [Virginia Tech]), there unfortunately are many other death reminders in schools. These might include gang rivalries, schoolyard fights, threats, or bullying, but also school environments laden with R.I.P. (i.e., rest in peace) graffiti messages in bathroom stalls and on the school building's exterior. Metal detectors at school entrances are common in urban schools, and so too are armed police officers on school grounds. We need to understand the impact of some of these mortality salience activations on students' academic motivation. This understanding will help educators, policy-makers, and researchers evaluate the effectiveness of school interventions, policies, and practices, as well as develop new strategies to help children succeed.

Previous research findings suggest that the understudied link between mortality salience and academic beliefs and behavior may be best understood as a social identity process. For instance, one effect of mortality salience is that it activates social identities (Castano et al. 2002). Research demonstrates that mortality salience causes stronger levels of in-group identification, and that this is related to in-group bias (Castano et al. 2002). Castano et al. (2002) have shown that mortality salience-induced effects of increased in-group bias can be mediated by group identification (Castano et al. 2002). This increased group identification may have applied implications for human behavior in educational contexts. Castano and colleagues have argued that by strengthening perceptions of a shared social identity, people are able to achieve a sense of psychological oneness with the in-group, extending the self over space and time, and overcoming the limitations of the corporal self (Castano and Dechesne 2005; Castano et al. 2002, 2004). By seeing the world through the lens of a particular social category (i.e., stronger group identification) academic motivation may be supplanted by stereotypical notions of one's own group's academic motivation. We expected that following a mortality salience induction, social identity processes would be active. We expected that students' academic values would more closely correspond with their group's academically-relevant stereotypes.

We examined our hypothesis in the domain of mathematics—an academic subject area of national concern. To the extent that one's ingroup is negatively stereotyped in the domain of mathematics, academic motivation might decrease following mortality salience. Because mortality salience has been known to increase social identification (Castano and Dechesne 2005), and because social identities serve as scripts that guide our beliefs and behaviors (Oyserman and Markus 1998), it follows that students' belief

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systems should be more in line with cultural academic stereotypes associated with the groups to which they belong when mortality is salient. It is important to note that we do not propose that mortality salience should be directly responsible for changes in academic motivation. Rather, we expect mortality salience should to make identity-relevant stereotypes more likely to influence students' self-judgments and motivation. The effect of these stereotypes on academic motivation is our focus here.

1.3 An overview of the present studies

In the present experiments, we examined the extent to which stereotype-consistent academic motivation is affected by mortality salience. In our first experiment, we used an externally-valid mortality salience induction, in the form of exposure to death-related graffiti. This manipulation was designed to mimic an aspect of the everyday urban environment of many schoolchildren. In our second experiment, we used a written manipulation of mortality salience to more directly test our idea. Of course, in everyday life, graffiti, gang activity, the presence of weapons, and school violence in general all might trigger mortality salience.

According to our logic, and following from the work of Castano and Dechesne (2005), mortality salience should strengthen reliance on one's social identity and its attendant stereotypes to influence judgments. Therefore, mortality salience should cause people to express increased value for mathematics, if embracing mathematics is a meaningful stereotype characteristic of one's in-group. Likewise, people should express decreased value for mathematics under mortality salience to the extent that embracing mathematics is not a meaningful stereotype characteristic of their in-group. Mortality salience, when combined with group stereotypes promoting or discouraging math engagement, should cause math value judgments to be more consistent with these stereotypes.

Results demonstrating stereotype-consistent academic values as a function of mortality salience would extend what is known about the impact of violence and death reminders in schools. Such results would suggest that, even for instances in which the salience of a student's own mortality is not the result of a directly-experienced traumatic event, death-related messages in and around schools could be especially problematic for the mastery of basic academic subjects, with downstream consequences for career choice and even graduation rates. We investigated whether mortality salience led to increased stereotype-consistent value judgments about math in the domains of gender stereotypes (Study 1) and ethnic stereotypes (Study 2).

2 Study 1

According to the Centers for Disease Control and Prevention (2007), counts of mortality in urban areas are nearly 4 times that of non-urban communities. En route to school, students in urban communities sometimes pass buildings graffiti-tagged with "R.I.P.," or pass roadside memorials dedicated to individuals who experienced early deaths. After arriving at school, students may also pass through metal detectors and be frisked for weapons before proceeding to their classrooms. We would predict that such

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reminders of death (or extreme school violence) would affect students' math values in a stereotype-consistent manner.

There are deep-seated cultural beliefs with respect to gender and mathematics. Although some progress has been made in achieving more equitable distributions of men and women in careers requiring extensive mathematics training, stereotypes about the relative math abilities of men and women still are widespread. For instance, comments about the supposed inferior math skills of women made by Lawrence H. Summers, Former President of Harvard University, contributed to his eventual resignation (Boston Globe, 2006).

In our first study, we focused on gender groups. Using value for learning about mathematics as our dependent variable, we predicted that gender stereotypes would manifest under conditions of mortality salience—causing members of each gender group to express increased stereotype-consistent math valuing.

Stereotypes about groups can impact academic performance and the identity development of individual group members (e.g. stereotype threat; Steele 1997). We investigated social categories that were the basis for early stereotype threat research. In Steele's seminal work, he tested his ideas using the social categories of ethnicity and gender. He reasoned that such categorizations were important because negative stereotypes about one's ethnicity and gender could result in academic disidentification, a shift in the self-concept such that academic performance is devalued (Steele 1997).

2.1 Method

2.1.1 Participants, materials and procedure

Sixty-nine introductory educational psychology students (26 male and 43 female) participated in this study. The investigation was described as a "simulation of the lived experience of urban students." The experiment was conducted in students' classrooms. Four classrooms were randomly assigned by blocks to either the control or experimental condition, yielding a quasi-experimental design. Participants completed paper and pencil measures, sealed them in an envelope, and placed them in a drop box at the front of the classrooms. Participants then were debriefed. Measures described below follow the order of the experiment.

2.1.2 Induction of mortality salience (MS) through Graffiti

On a projector screen, participants in both conditions were shown three images of graffiti, one after another. In the control condition, the images of graffiti were pictures and names (see Fig. 1). The experimental condition also saw images of graffiti that were pictures and names; however, these images conveyed death-related messages. For example, one graffiti image in the experimental condition was a picture of a heart, which read "rest in peace," and made reference to 9/11 (also see Fig. 1). We chose these death-related images in particular because past research has shown that references to 9/11 increase accessibility to death-related thoughts (Landau et al. 2004). For each image, students responded to two open-ended questions, "What is your overall

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Fig. 1 Sample images shown to participants. Sample images from control (*top*) and mortality salience conditions (*bottom*)

impression of this image?" and, "Is there anything in particular about this image that draws your attention?"

2.1.3 Affect measure

At this point, participants completed the Positive and Negative Affect Schedule—Expanded Form (PANAS-X; Watson and Clark 1991). This scale was followed by the morningness–eveningness Questionnaire (Horne and Ostberg 1976) to provide a filler task.

2.1.4 Task value

On the projector screen, participants were shown the mathematical formula for mean $\left(\sum_{i=1}^{N} Y_i / N\right)$.Participants then completed a version of Eccles and Wigfield's measure of task value (see Eccles and Wigfield 1995, for a review). The task value measure included a total of seven items which measured intrinsic value (e.g. "I would find working on math assignments such as these: 1 = *Very boring*, 7 = *Very interesting*."), attainment value (e.g. "For problems such as these, I feel that, to me, being good as solving problems that involve math or reasoning mathematically is: 1 = *Not at all important*, 7 = *Very important*."), and utility value (e.g. "How useful is learning about

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math concepts like this for what you want to do after you graduate and go to work? 1 = *Not at all useful*, 7 = *Very useful.*").

2.2 Results and discussion

The seven task value items were averaged into an index ($\alpha = .91$) with higher scores indicating greater valuing of mathematics learning. Analyses of affect revealed no significant effects of the MS manipulation on either positive affect ($\beta = .15$, $t(66) = .08$, $p = .94$) or negative affect ($\beta = .89$, $t(66) = .69$, $p = .49$).

Because previous research has shown that the salience of the United States September 11th, 2001 tragedy makes thoughts of death more accessible (see Landau et al. 2004), we checked participants' responses to ensure that participants in the experimental condition were, in fact, attending to the death-related messages embedded in the graffiti images. Whereas participants in the control condition commented on the "art" of the graffiti, participants in the MS condition commented on death-related messages in the images addition to aesthetics. For example, one participant wrote: *This image is really pretty. It appears to be a tribute to those who passed away during 9/11.*

2.2.1 Value for learning about mathematics in males and females

A 2 (gender) × 2 (condition) ANOVA was conducted on value for math. We predicted that mortality salience (MS) would moderate the effect of gender on the value individuals placed on learning mathematics, such that MS would produce increases in the valuing of learning about math among males, and decrease the valuing of learning about math among females (Fig. 2).

Analyses revealed a main effect of condition, $F(1, 65) = 4.56$, $p = .037$; as well as a main effect of gender, $F(1, 65) = 4.35$, $p = .041$. That is, the MS condition expressed greater value than the control condition, and males expressed greater value than females. These effects were qualified by our predicted condition × gender interaction, $F(1, 65) = 7.24$, $p < .01$. When primed with MS, males expressed greater valuing than did females for learning about the math concept ($F(1, 65) = 4.35$, $p = .04$; see Fig. 3), whereas in the control condition males expressed marginally lower levels of academic motivation compared to females; $F(1, 65) = 3.28$, $p = .08$. Further decomposition of the condition by gender interaction revealed that for men, MS participants significantly increased valuing for mathematics compared with control participants, $F(1, 65) = 4.35$, $p = .04$, and for women, MS marginally decreased valuing for mathematics $F(1, 65) = 3.05$, $p = .09$. In sum, MS was associated with a pattern of stereotype-relevant valuing of mathematics, in accordance with gender stereotypes.

These results suggest that death reminders may indeed be a problem. However, our use of graffiti, while optimal from the perspective of external validity, leaves something lacking when considering construct validity—can we be certain that it was thoughts of death, and not, for instance, incidentally-increased national identification,

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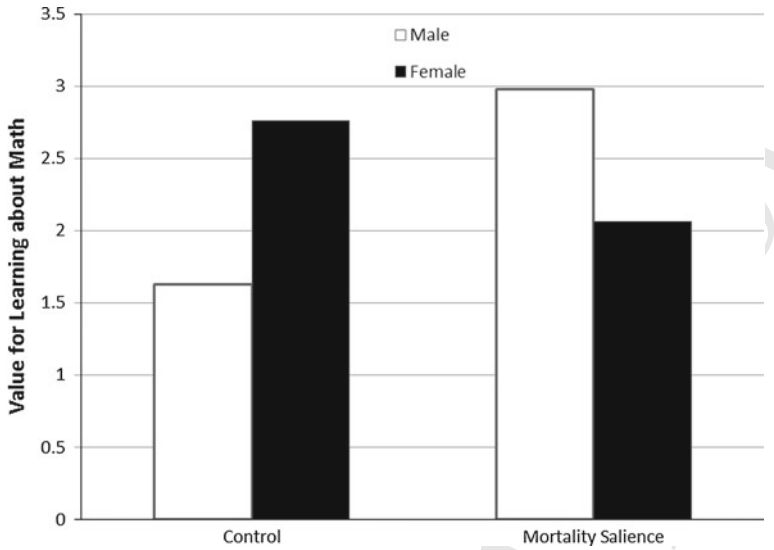

Fig. 2 Interaction of mortality salience and gender predicting value for learning about mathematics

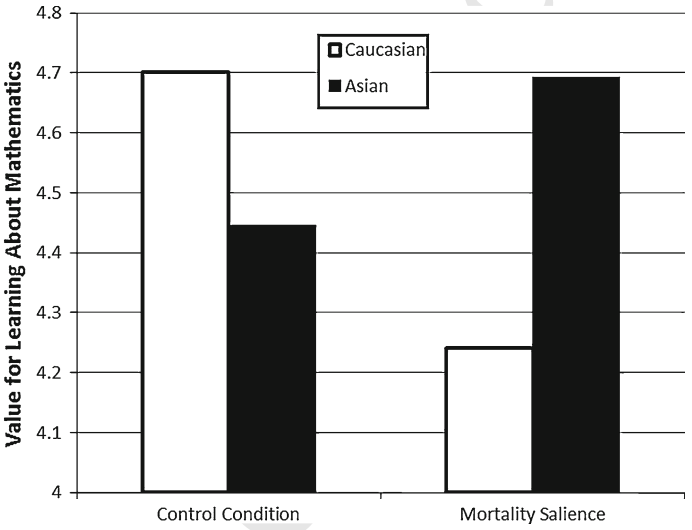

Fig. 3 Interaction of mortality salience and ethnicity predicting value for learning about mathematics

that was responsible for our Study 1 effects? We conducted a second study to address this question.

3 Study 2

In our second study, we focused on the American stereotype that *excelling at math is for me if I am Asian, but not if I am Caucasian* (after Aronson et al. 1999; p. 39). We

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used the same dependent variable as in Study 1. In line with cultural stereotypes and standards, we expected that Caucasians, compared with Asians and Asian-Americans, would decrease in their value for math learning under MS versus a control condition. Asian and Asian-American participants were expected to show increased math valuing under MS, versus a control condition.

According to our thinking, changes in valuing under MS should be due to increased stereotype-consistent cognitions. Personal, or non-stereotype related cognitions, should have no impact on determining MS effects. In other words, if MS has its effects by activating social identity-relevant knowledge, personal math ability would not be expected account for MS effects. If perceptions of personal math ability did account for the effects of MS on value for learning about mathematics, though, this would suggest that our theoretical perspective was wrong. To investigate this, we included a measure of participants' perceived math ability in Study 2 as our covariate to assess whether our significant interaction from Study 1 could be replicated—above and beyond the association between perceived math ability and task value.

3.1 Method

3.1.1 Participants

Introductory psychology undergraduates from a mid-sized university along the Eastern Seaboard participated in this study. In terms of the demographics of this particular institution, 50 % of all undergraduates are Caucasian and 28 % Asian or Asian American. Previous research has noted that Caucasians feel added pressure in mathematics and science fields under conditions in which they are in the presence of Asians or Asian Americans (Seymour and Hewitt 1997). This condition was met by having participants (N = 138) complete their survey packets together in the same lecture hall; 88 were Caucasian and 50 were Asian or Asian American.

3.1.2 Materials and procedure

Participants completed what was described as two studies. The first "study" contained the mortality salience manipulation. The second "study" was described to participants as follows: "On the following pages you will find a few questions asking about how much you care for learning about a particular subject. Students have been assigned to various subjects, but yours is math." In actuality, all students were assigned to mathematics. Students were debriefed upon completion. Measures are described below in the order they appeared for participants.

3.1.3 MS manipulation and delay

The MS induction (Rosenblatt et al. 1989) was comprised of two open-ended response questions (e.g."Jot down, as specifically as you can, what you think will happen to you physically when you die and once you are physically dead"). The control condition was given parallel questions regarding dental pain.

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3.1.4 Affect measure

At this point, participants completed the PANAS-X, followed by the morningness–eveningness Questionnaire (Horne and Ostberg 1976) as a filler task.

3.1.5 Task value

As an example of a math concept in their packets, participants were shown the formula for the mean (as in Study 1). Participants also indicated their value for learning about this concept by completing the adapted version of Eccles and Wigfield (1995) expectancy-value measure of academic achievement motivation, as in Study 1.

3.2 Results and discussion

The value for learning scale was aggregated as described for Study 1. It again demonstrated acceptable reliability ($\alpha = .83$).We first investigated whether our dichotomous predictor variables had effects on either general positive or negative affect as computed according to the PANAS-X manual (Watson and Clark 1994). ANOVAs with condition and ethnicity as predictors revealed no significant main effects or interactions for either positive or negative affect (all tests showed $p = .15$ or higher). This null result is consistent with the findings of many previous MS studies.

Value for Learning about Mathematics in Asians and Caucasians. Next, a 2 (ethnicity) $\times$ 2 (condition) ANCOVA, including perceptions of personal math ability as a covariate, was conducted on task value. We predicted that MS would moderate the effect of ethnicity on the value individuals placed on learning mathematics, such that MS would cause Caucasian students to value learning about math relatively less, and Asian students to possibly increase their valuing of learning about this subject.

The ANCOVA revealed that perceived personal math ability was a significant covariate, $F\,(1, 132) = 52.25$, $p < .001$). While there were no significant main effects of condition or ethnicity ($ps > .55$), the predicted condition by ethnicity interaction was significant ($F\,(1, 132) = 3.84$, $p = .05$). The MS induction impacted students valuing for learning about mathematics as expected (please see Fig. 3). Simple contrasts showed that this effect was caused mainly by Caucasian students reporting significantly reduced valuing for learning about math under MS compared with the control condition ($F(1, 132) = 4.61$, $p = .03$). Asian students showed the theoretically-expected, but non-significant, trend in a positive direction ($F(1, 132) = .72$, $p = .40$).

4 Discussion

The results of Study 2 again suggest that individuals may, for better or worse, endorse the stereotypes of their in-groups under MS. It appears that as people become aware of their temporary physical existence, the value they place on learning shifts in a direction that is representative of the stereotypic academic values of their in-group. As our results show, these consequences are not always positive. Our use of a more

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face-valid MS manipulation, in addition to the use of personal math ability beliefs as a covariate, both increase our confidence that these effects may in fact be caused by everyday reminders of death, and that they reflect stereotype-consistent (not personal ability consistent) cognitive responses.

The results of both studies support our hypothesis that MS causes individuals to endorse stereotype-consistent academic values. Our results are not at all meant to be depressing. Instead, the graffiti MS prime used in Study 1 represents an environmental stimulus that can be found in and around schools that may impact aspects of a student's learning experiences in ways that students themselves are not even aware. We would be wrong to consider such stimuli inconsequential. In fact, our results suggest that death reminders, even embedded in graffiti, may inhibit the advancement of students who have been historically stigmatized and underserved in this particular academic domain.

Although Study 1 used random assignment by blocks, given the findings of Study 2, it seems to us unlikely that these effects are a result of classroom differences. Further, a classroom-effect explanation would have to explain differences between men and women in some classes, but not others. Participants were sampled across different sections of the same course, and we cannot think of an explanation as to why one random sample of these sections would show gender differences, but the other would not.

Building on previous literature, we have shown that death-laden stimuli can activate stereotype-relevant motivational beliefs in mathematics even in the absence of specific instructions calling attention to relevant stereotypes (c.f. Landau et al. 2009). Moving forward, we would like better to understand the links between participants' specific self- and stereotype-relevant beliefs and valuing for mathematics. In our studies, we relied on general awareness of ethnic and gender stereotypes, and we did not measure participants' individually-held stereotypic beliefs. Measuring such beliefs in future research would provide an even better understanding of the academic effects of death reminders. Observations and interviews would also prove useful for approaching an understanding of mortality salience in academic settings from different methodological perspectives.

We believe these findings may generalize to the other academic domains (e.g., English)—an important question for future research. We focused on mathematics in the present study due to the strong underpinnings of gender and ethnicity stereotypes in this domain, and due to the fact that advanced mathematics courses are an integral aspect of academic pathways in STEM. Our findings may have relevance anywhere that stereotypes suggest one group might academically under-perform, relative to another. As one example, our studies highlight a potential psychological barrier associated with student advancement in STEM careers (Science, Technology, Engineering, and Mathematics). Career choice can be traced, in part, back to the classes students opt to take while in school. As such, STEM choice interventions are often aimed at increasing the extent to which people come to value learning about a specific subject area while they are in school. This is reflected in White House initiatives such as National Lab Day —a national collaboration between scientists, engineers, and educators to bring discovery-based science experiences to local communities. In conjunction with large-scale initiatives, we need to understand and address the everyday stimuli that affect important

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outcomes, such as academic values. Interventions designed to address everyday stimuli will likely be cheaper, require less logistical work before implementation, and are likely to be more locally sustainable.

Fortunately, the contents of group identities—or the perceptions of the norms, standards, and cultural mores of one's cherished ingroup—are socially determined. In a recent experiment, Elmore and Oyserman (2011) manipulated students' perceptions of what it meant to be "male" or "female" in the domain of mathematics. When girls viewed math achievement as part of the script for what it meant to be "female," they were more motivated to achieve in math. And when boys viewed math achievement as part of the script for what it meant to be "male," they too were more motivated to achieve in math. Elmore and Oyserman's work thus demonstrates that changing students' perceptions of whether achieving in math is "*for people like me*" (Oyserman et al. 2012, p. 88) can motivate student achievement despite students' identification with groups which historically have been stigmatized in that domain. So, "flipping the script" of an identity to be consistent with academic achievement in mathematics is one possible way to counter the potentially psychologically damage of extreme school violence on students' academic pursuits.

We believe that an understanding of the impact of everyday mortality salience triggers—and ways to counteract its possibly negative consequences—will allow us to better provide children of all backgrounds the genuine opportunities for success that they deserve. Alongside efforts to change the contents of students' identities (Oyserman 2009), our findings suggest that minor alterations in school policies and procedures (such as the removal of death-related graffiti images on school grounds) have the capacity to reduce the perpetuation of such stereotypes as "math is for me only if I am *male*," and that "math is for me only if I am *Asian.*" It is our hope that the present study will serve as a springboard for future investigations of the association between academic motivation and mortality salience.

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