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Culture, Context and Stereotype Threat: A Comparative Analysis of Young Ugandan Women in Coed and Single-Sex Schools

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ABSTRACT. Stereotype threat (ST) has been linked to under performance and academic disidentification among girls in mathematics and science as well as African Americans in academics. However, it is still unclear whether ST and its negative effects extend to non-Western cultures. The authors explored the effects of ST on Ugandan females in coed and single-sex (all-girls) schools. Results indicated that although ST did not affect the performance of girls in the single-sex school, it negatively impacted the performance of females in the coed school. Further, these effects appear to have been moderated by school context, with females in single-sex schools reporting higher levels of mathematics identification and mathematics self-efficacy than those in coed schools.

Keywords: coeducation, gender stereotypes, mathematics, mathematics self-efficacy, stereotype threat

Steele and Aronson's (1995) seminal work on stereotype threat (ST) created a new paradigm for examining and better understanding the relatively lower academic outcomes of racial minorities in higher education and women in the domains of mathematics and science. Defined as a concern and anxiety over confirming a negative stereotype about an individual's group, ST has been shown to have a negative impact on the performance of Blacks (Steele, 1997; Steele & Aronson, 1995), other minorities (Aronson & Salinas, 1997; Gonzales, Blanton, & Williams, 2002), and girls in stereotypically male domains such as mathematics (Aronson, Quinn & Spencer, 1999; Brown & Pinel, 2003; Schmader, 2002).

Since its debut in the field of social psychology, ST theory has evolved from merely establishing its existence to identifying factors that moderate its deleterious effects. Toward this end, individual differences in domain identification (Steele, 1997), gender identification (Schmader, 2002), stigma consciousness (Brown & Pinel, 2003), self-efficacy (Hoyt, 2005), and locus of control (Cadinu, Maass, Lombardo, & Frigerio, 2006) have all been demonstrated to moderate the performance of individuals under ST.

The identification of these moderators provides a broader understanding of the nature of the threat and which individuals are most susceptible to it. However, the extant literature has been limited in two ways. First, ST studies have been confined to Western countries or cultures, primarily the United States (e.g., Ambady, Shih, Kim, & Pittinsky, 2001; Beilock, Rydell, & McConnell, 2007; Schmader, 2001) but also France (Huguet & Regner, 2007) and Italy (Cadinu et al., 2006; Cadinu, Maass, Rosabianca, & Kiesner; 2005). Thus, it is not clear whether the phenomenon and its negative effects extend to non-Western cultures. Second, the search for mediators and moderators that potentiate or exacerbate the negative effects of ST have been largely limited to person-centered cognitive and affective factors (Brown & Pinel, 2003; Eriksson & Lindholm, 2007; Good, Aronson, & Harder, 2007; Inzlicht & Ben-Zeev, 2000; Keller & Dauenheimer, 2003; Kiefer & Sekaquaptewa, 2007; Lesko & Corpus, 2006; Marx & Stapel, 2006; McGlone & Aronson, 2006; Spencer, Steele, & Quinn, 1999). Thus, contextual factors—beyond the presence or absence a "threat in the air" (Steele, 1997)—have been ignored.

In the present study we sought to fill both of these context-related voids in the literature by exploring the effects of stereotype threat on Ugandan females in coed and single-sex (all-girls) schools. In doing so, we hoped to extend the field of ST research by investigating its applicability in a non-Western culture and the potential moderating effects of school setting (coed vs. single sex) on ST. Before turning to a detailed description of the present ST experiment, and its results and their discussion, we present a brief review of three bodies of literature: (a) ST and its impact on girls

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in stereotypically male domains; (b) gender stereotypes in Africa, particularly negative ones surrounding girls in male-dominated fields; and (c) the effects of single-sex school settings on girls' motivation and achievement in mathematics.

Stereotype Threat and Girls' Achievement in Mathematics

ST has been conceptualized as concern and anxiety over confirming a negative stereotype about an individual's group (e.g., Steele, 1997; Steele & Aronson, 1995). More specifically, when a negative stereotype about the ability of an individual's in-group in a particular domain is highlighted (e.g., girls' performance in mathematics), individuals belonging to that group feel under threat (of reifying the stereotype) and, as a result of the ensuing anxiety, perform at levels significantly worse than they otherwise would in the absence of the stereotype.

ST studies have consistently demonstrated that girls tend to underperform in mathematics-related tasks when negative stereotypes about women in mathematics are made salient (e.g., Aronson et al., 1998; Brown & Pinel, 2003; Huguet & Regner, 2007; Keller & Molix, 2008; Quinn & Spencer, 2001; Schmader, 2002; Spencer, Steele, & Quinn, 1999; Steele, 1997). For example, Spencer et al. (1997) found that women performed less well than men on a difficult Graduate Record Evaluation test after being primed with statements indicating that gender differences (favoring boys and men) were typical. In the same study, Spencer et al. ran a girls-only variation of this experiment, whereby participants were placed in one of two groups: an experimental group in which they were told beforehand that there were gender differences in performance on the test and a control group in which no gender differences were mentioned prior to the test. As with the coed experiment, girls primed for gender differences in mathematics performed worse than those in the control group.

Although the seminal—and much of the subsequent research—on ST among women in mathematics has focused on college-aged students, there is evidence that ST also adversely affects younger girls (e.g., Ambady, Shih, Kim, & Pittinsky, 2001; Huguet & Regner, 2007). Ambady et al. (2001) assigned Asian American girls from the lower and upper elementary school grades and from middle school to one of three conditions: one in which Asian identity was activated by asking students to color a picture of an Asian holding chopsticks, a second in which female identity was activated by asking students to color a picture of a girl holding a doll, and a third control group (in which no group identity was intentionally activated). The authors found that lower elementary school and middle school girls in the gender identity condition performed significantly worse on a subsequent mathematics test than those students assigned to the ethnic identity and control groups.

Taken together, these studies show ST to have a negative impact on girls across several cultural groups and that the phenomenon affects girls at an early age—as young as 5 years old. However, it is important to note, that ST does not negatively affect the performance of all girls in domains that are perceived as being stereotypically male. As shown by Steele (1997) and others (Brown & Pinel, 2003; Kiefer & Sekaquaptewa, 2007; Lesko & Corpus, 2006), for ST to have a significant impact on an individual's performance, the individual must not only be aware of and believe in the stereotype, but he or she must also have a personal investment or stake in the domain for which the stereotype applies (e.g., women who care about doing well in mathematics, and perceive it as important to their future careers). In short, domain identification appears to be a critical precursor to the relationship between ST and underperformance. Thus, for the present investigation to demonstrate ST effects in a non-Western country, such as Uganda, two conditions needed to be met: the presence of (a) negative gender stereotypes about girls and women in mathematics and (b) girls and women who identify with mathematics and care about being successful (or seen as successful) in this domain. As detailed next, a review of the literature seems to suggest the existence of negative gender stereotypes of girls and women in mathematics as well as varying degrees of female identification with the mathematics domain (based on belief in these stereotypes).

Mathematics-Related Gender Stereotypes in Africa

As in the United States, and the rest of the Western world, negative stereotypes about women's mathematics abilities exist in Africa. And, as in the West, these stereotypes are manifest in myriad ways in Africa—from low parental and teacher expectations of young girls on mathematics-related tasks and tests to the underrepresentation of women in mathematics-related professions. Indeed, the expectations to conform to prescribed gender roles are great in Africa, and appear to inhibit the entry and achievement of African women in mathematics and a number of traditionally male-dominated fields (Martineau, 1997). As described by Gordon (1995), the gender role socialization process begins early through the internalization of patriarchical principles at home and is reinforced in schools through teachers' attitudes and expectations.

With respect to gender role socialization, a study of teacher expectations of students in Zimbabwe (Gordon, 1995) revealed that teachers of both sexes believed that (a) boys and girls possessed different (i.e., gender-specific) intellectual abilities, aptitude, and potential and (b) it was their duty (as teachers) to guide students toward gender-appropriate behavior and occupations. Specifically, teachers in this study described boys as being more serious about school, more intelligent and better able to grasp complex concepts compared with girls.

A subsequent study of student attitudes by Gordon (1998) showed that male secondary school students expressed stereotypes similar to those held by teachers: 36% believed that young men were more intelligent than young women and more than half (50.6%) believed that although both sexes were equally intelligent, young men and young women had different types of intelligence. Congruent with gender stereotypes, young women were rated as being intelligent in subjects such as food and nutrition, fashion, and fabrics, and young men as being intelligent in the sciences and agriculture. Reports from the qualitative study also showed that most young men believed young women were poor at mathematics because they lacked the ability to think and reason as they did. As such, male-dominated fields such as engineering, aviation, science, and mechanics were perceived as being suited for men and not women.

These stereotypes held by teachers and male students about girls' and women's intelligence and gender-appropriate career pursuits can deeply affect female students. For example, empirical studies by Nenty (1999, 2008) demonstrated that South African girls who endorsed mathematics as a male-only subject not only exhibited low levels of mathematics identification and efficacy, but also tended to perform significantly worse than girls who did not endorse these stereotypes. These findings lead to questions about the importance of school context and whether single-sex (i.e., all-girls) schools might mitigate young women's exposure to negative stereotypes about girls and women in the mathematics domain and thus offset the extent of their internalization and ultimate manifestation in lower motivation and achievement in mathematics.

School Context and Girls' Motivation and Achievement in Mathematics

Although there are no existing studies exploring ST effects in single-sex versus coed school settings, there is a broader literature on the effects of these distinct settings on female motivation for and achievement in various academic domains (Carpenter, 1985; Carpenter & Hayden, 1987; Gillibrand, Robinson, Brawn, & Osborn, 1999). Previous studies have shown single-sex education to have strong positive effects on the achievement and self-concept of girls (Carpenter, 1985; Lee & Bryk, 1986). Specifically, girls in single-sex schools not only report higher levels of identification and self-efficacy (Gillibrand et al., 1999; Kessels & Hannover, 2008) in the physical science domains, but they also, on average, score higher on standardized tests in these subjects relative to girls in coed schools (Van der Gaer, Pustjens, Van Damme, & De Munter, 2004; Young & Fraser, 1990).

Carpenter and Hayden's (1987) study of girls in single-sex and coed schools in Australia revealed that girls identified more strongly with the sciences and were more inclined to pursue these subjects at the high school level compared with those girls in coed schools. Similarly, Gillibrand et al. (1999) conducted a study to assess the impact of single-sex classes on girls in coeducational schools. The authors found that compared with young women in coeducational physics classes, young women who studied physics in single-sex classes experienced significant gains in physics identification and efficacy. They also performed significantly better than their counterparts in the coeducational classes on the British standardized achievement test in the subject. These effects seem to be stable, even after controlling for background factors such as initial ability and socioeconomic status (SES; Jiminez & Lockheed, 1989).

The Present Investigation

In the present investigation we addressed two questions related to the foregoing review of literature.

First, do Ugandan young women at a single-sex high school exhibit different levels of domain identification, self-efficacy, and performance in mathematics compared with their coed counterparts? Consistent with research findings in Western countries, we hypothesized that compared with young women in the coed school, young women in the single-sex school would report higher levels of identification and self-efficacy in the mathematics domain, and earn significantly higher scores on a mathematics achievement test.

Second, does ST have an effect on Ugandan women, and if so, are its effects on the mathematics performance moderated by school context (i.e., coeducational and single-sex schools)? Based on existing empirical and theoretical work on gender stereotypes, we hypothesized that ST would impact the performance of young Ugandan women and that school context would moderate its negative effects. Specifically, young Ugandan women from the coed secondary school were expected to perform significantly worse on a mathematics achievement test under conditions of ST compared with young Ugandan women from the single-sex secondary school.

Method

Participants

Recruitment. The study was conducted in two phases, each one week apart: (a) survey administration and (b) the completion of a challenging mathematics test. The study was approved by the principals of both schools and the University of Connecticut's Institutional Review Board. A research assistant unaffiliated with either school solicited participation for the study, which was presented as a study on regulating emotions. Solicitation took place in mathematics classes at prearranged dates and times between the research staff and the mathematics teachers at both schools. Participation was voluntary, but parental consent was required. Thus, only students who volunteered and had parental consent participated in the study. Participants were not paid for their involvement in the study. Participants were 15- and 16-year-old 10th-grade female students ($N = 89$) in two secondary boarding schools in Uganda participated in the study. The two schools were matched by level of students' academic performance: Both were high performing and consistently ranked in the top 10 among Ugandan secondary schools.

Measures

Pre-experiment surveys. The pre-experiment survey was a 13-item questionnaire that consisted of demographic information and the mathematics identification and self-efficacy scale adapted from Brown and Josephs (2000), anchored by a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Mathemathematics Achievement Test. Participants' mathematics abilities were assessed with the Mathematics Achievement Test (MAT). The MAT was created for the purposes of this experiment and modeled after the national exams administered by the Uganda National Examinations Board (UNEB). Mathematics teachers from both schools were asked to provide a list of topics that had been covered in the Grade 10 curriculum during the present academic year. The list was reviewed by the researchers, and common topics already covered were selected as topics for the exam. These teachers were then provided with the a list of mathematics topics that had been jointly covered by students in both schools. They were asked to each create 15 difficult multiple-choice test items evenly distributed among the topics provided and akin to questions that typically appear in UNEB exams. The final test consisted of 15 questions randomly selected from each set of test questions created by these mathematics teachers. The test content areas assessed included algebra, trigonmetry, geometry, and calculus (see the Appendix A for a copy of the exam). Students completed the mathematics test on computer coding sheets that were mailed to the researchers and graded electronically at the University of Connecticut.

Mathematics identification and self-efficacy scale. Exploratory factor analyses on the mathematics identification and mathematics self-efficacy items were conducted separately for each school. In both cases, principal axis factoring with direct oblimin rotation was used (Pett, Lackey, & Sullivan, 2003). Results based on data from both schools supported a two-factor structure: mathematics identification and mathematics self-efficacy. The two-factor solution based on data from the single-sex school (Kaiser-Meyer-Olkin [KMO] statistic = .81; Bartlett's test of sphericity, $p < .001$) explained 60.5% of the variance in the scale, with mathematics self-efficacy explaining the most variance (43.74%). The KMO statistic and Bartlett's test of sphericity in the coed school was identical to that of the single-sex school. However, the two-factor solution explained 54.9% of the variance in the scale, 40% of which was explained by mathematics self-efficacy. After establishing identical factor structure in both schools, data sets were combined and reliability analyses for the subscales were conducted.

Psychometric properties. The six-item Mathematics Self-Efficacy scale assessed particpants' self-perceptions of their abilities in mathematics with statements such as "Compared to other students my age, I am good at mathematics," "Work in mathematics classes is easy for me," and "I do not learn things quickly in mathematics," (Cronbach's $\alpha = .86$; see Appendix B for complete scale items).

The Mathematics Identification scale consisted of four items, such as "My mathematics abilities are important to me" and "My mathematics abilities will be important to me in my future career." Reliability analysis yielded a Cronbach's alpha value of .40, which was very low and likely a function of homogeneity of responses on the subscale; the distribution of mean scores was negatively skewed, with a critical ratio of −.2.77 and with 93% of participants averaging 5 or greater on the 7-point scale (which was also indicative of an almost exclusively, highly mathematics-identified sample). As described by Thompson (2003), such restriction of range in response distribution weakens interitem correlations and compromises scale reliability. Consequently, although mathematics identification is still used to address (part of) the first research question exploring school differences in mathematics motivation and achievement, it was not used as covariate in analyses addressing the second research question investigating the moderating effect of school context on the effects of ST.

Procedures

The experiment at the single-sex and coed schools was carried out during the same month of the 2008–2009 acaemic year, using the same procedures and measures.

Pre-experiment questionnaire. A week after the consent forms were obtained, trained research staff administered the pre-experiment questionnaire to participants in a central location at their respective schools, immediately following school. Prior to completing the surveys, forms containing unique index (identification) numbers were randomly distributed to participants. The index numbers constituted six digits: the first three comprising a 2-digit school identification number and a third digit identifying what experimental group the student would subsequently belong to (i.e., 1 = control and 2 = ST condition). The next three digits were random and corresponded to the total number of 10th-grade students in each participating school. Student names were then recorded next to their index numbers on a sheet that contained all the index numbers. This was done to ensure correct student placement in the experimental groups for the second part of the study the following week.

After completing the questionnaire, participants were asked to report for the second phase of the study 1 week later. A total of 116 young women in the single-sex school completed the survey, and 51 returned for the mathematics test a week later. At the coed school, 190 individuals completed the survey, and 95 returned the following week to complete the mathematics test. Of the 95 participants who completed the study in the coed school, 38 were females. A total of 89 females participated in both parts of the study. Because the focus of the study was young women, analyses were conducted using young women in the coed school.

Experiment. Upon arriving for the exam, students were randomly assigned to one of two groups: a control group or an experimental group primed for gender. Students were selected into control or experimental groups based on the third digit of their 6-digit index numbers. The third digit was either 1 or 2, representing allocation to the control or the experimental group, respectively. Once students were in their respective test-taking classrooms, the research staff read aloud instructions for the exam, which, in the experimental condition, had propsective ST embedded. The instructions also appeared on the exam question sheet distributed to the students.

The following description was used in the experimental group to introduce the exam as being diagnostic of ability:

> You are about to take the Math Achievement Test (MAT). The MAT is a very reliable indicator of one's math ability, and is typically used to test mathematical skills, and predict students' ability to excel in future advanced levels of mathematics courses. In the 15 years that it has been used, the Math Achievement Test has successfully distinguished students with a natural ability to excel in mathematics from those lacking the skills to be successful in math. The test has also consistently shown there to be differences in performance between boys and girls. Please answer the questions provided below to the best of your ability. Your performance on this exam will be compared to the performance of students at St. Mary's College Kisubi.[1]

The control group received basic instructions for the exam:

> This exam consists of 15 multiple-choice questions and should take approximately 45 minutes to complete. As you complete the exam, please use the work sheet provided to calculate your answers. Each question is followed by four possible answers. Only one answer is correct. Using a No. 2 pencil, please indicate which answer you think is correct by shading in the circle that corresponds to that answer on the blue computer sheet.

All students were debriefed upon completion of the exam. They were also provided with hard copies of the debriefing forms.

Results

School Differences in Mathematics Motivation and Performance

In Uganda, do young women at a single-sex high school exhibit different levels of domain identification, self-efficacy, and performance in mathematics compared with young women at a coed high school?

To test the hypothesis that young women at the single-sex school would exhibit higher levels of mathematics motivation (identification and self-efficacy) and performance (scores on the MAT), a series of three two-sample *t* tests was conducted. As detailed in Table 1, this hypothesis was supported: Young women from the single-sex school reported significantly greater levels of mathematics identification and self-efficacy and performed significantly higher on the MAT than young women at the coed school. All three differences were statistically significant ($p < .01$) with effect sizes that were medium (mathematics efficacy $d = .62$; mathematics performance $d = .74$) or large in magnitude (mathematics identification $d = 1.90$)

Stereotype Threat in Uganda

Does ST affect Ugandan women, and if so, is it moderated by school context?

To test the hypothesis that ST would affect the performance of young Ugandan women under ST conditions, one-way analyses of variance (ANOVAs) were conducted for

TABLE 1. Mathematics Identification, Efficacy, and Performance, by School: Means, Standard Deviations, and Two-Sample *t*-test Statistics

	Coed school ($n = 38$)		All-girls school ($n = 51$)				
Test	M	*SD*	M	*SD*	M difference	*t*	Cohen's *d*
Identification	3.35	1.92	6.37	1.18	3.02	8.38*	1.90
Efficacy	3.95	1.46	4.80	1.27	0.85	2.94*	0.62
Performance	28.95	11.93	38.20	12.92	9.25	3.49*	0.74

Note. The *t* value for identification was adjusted to account for unequal, between-group variances. Cohen's $d = M2 - M1/\sqrt{[(\sigma 1^2 + \sigma 2^2)/2]}$; *d* values between .2 and .5 constitute a small effect, between .5 and .8 constitute a medium effect, and .8 or greater indicate a large effect.
*$p < .01$.

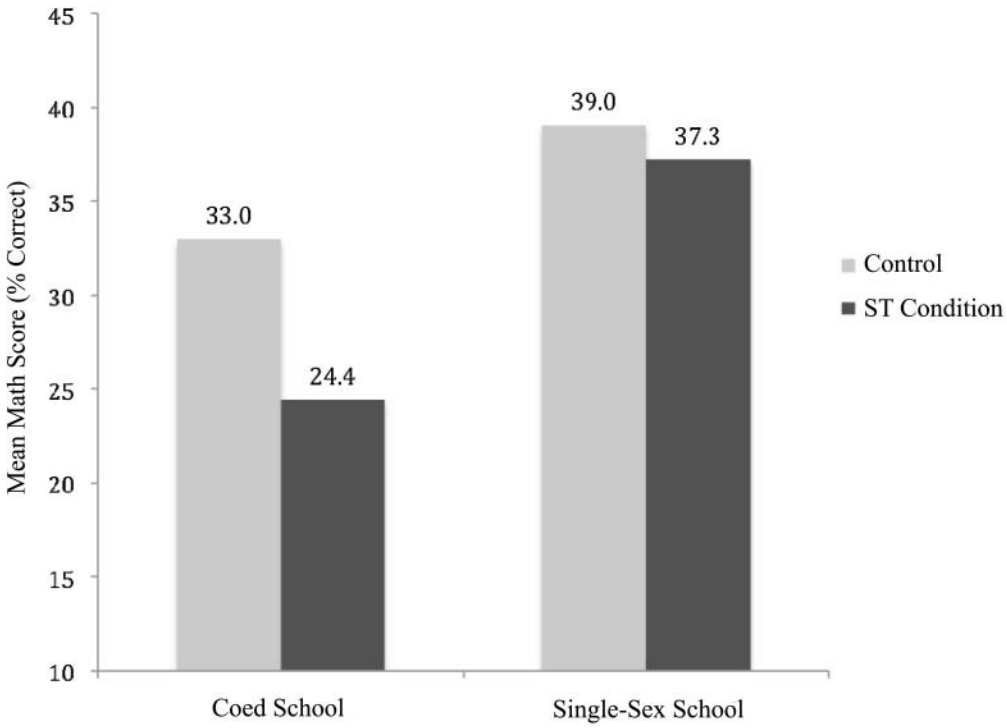

FIGURE 1. Stereotype threat effects on mathematics achievement scores of young women from a coed school versus young women from a single-sex school.

each school. Results showed differences between treatment groups to be nonsignificant for the single-sex school, $F(1, 49) = 0.24$, $p > .5$, but statistically significant for the coed school, $F(1, 36) = 5.5$, $p < .03$. This finding indicated that ST had no effect on the performance of young women in the single-sex school. However, in the coed school, young women exposed to ST performed significantly worse than their counterparts in the nonthreat condition. As depicted in Figure 1 and described in the upper half of Table 2, the difference between the ST and non-ST conditions was magnified in the coed school.

To test whether ST effects were moderated by school context, a 2 (condition: treatment vs. control) × 2 (school: coed vs. single sex) ANOVA using mathematics test scores as the dependent variable was conducted. The main effects for school context and treatment condition remained significant; young women at the single-sex school performed better than their counterparts at the coed school, $F(3, 85) = 12.73$, $p < .001$, $\eta^2 = .13$, on the mathematics test. The results also showed that in both schools, young women in the ST condition earned lower scores on the mathematics test compared with those in the non-ST condition, $F(3, 85) = 3.83$, $p < .05$, $\eta^2 = .04$. However, the hypothesized context by condition interaction did not achieve statistical significance, $F(3, 85) = 1.64$, $p > .2$, $\eta^2 = .02$, suggesting

TABLE 2. Mathematics Performance, by School and Condition: Means and Standard Deviations

	Control			ST treatment		
School	*n*	*M*	*SD*	*n*	*M*	*SD*
Coed	20	33.00	11.13	18	24.44	11.41
Single sex	27	39.04	13.13	24	37.25	12.89

TABLE 3. Results from a 2 × 2 Analysis of Variance and Analysis of Covariance Exploring School, Treatment, and School × Treatment Effects

Test	$F(3, 85)$	η^2	Observed power
Identification	—	—	—
School	12.73^{***}	.13	0.94
Condition	3.83^{*}	.04	0.49
School × Condition	1.64	.02	0.25

Note. Mathematics identification was the covariate. For η^2, .01 = small, .05 = medium, and .08 or greater = large.
$^{*}p < .05$. $^{***}p<.001$.

no moderating effect of school on mathematics performance under ST.

Discussion

A gap in the literature concerning the validity of stereotype threat effects in non-Western cultures formed the basis for this research study. Results from the study confirmed our a priori hypothesis that congruent with extant literature, young women in single-sex schools would not only report higher levels of identification, and efficacy in mathematics, but also perform well on the mathematics test compared with their coed counterparts.

Perhaps more importantly, the findings from these subjective, self-report measures were given validity by significant differences in performance on an objective, standardized measure of mathematics ability: Young women at the single-sex school outperformed young women at the coed school. Existing literature on young women and mathematics achievement in the United States and other Western countries has shown that girls and young women in single-sex schools experience positive outcomes in mathematics and science compared with their coed counterparts. Results from this study seem to suggest that the same may be true of girls and young women in African schools.

The hypothesis that ST would affect young Ugandan women was supported, but the hypothesis that it would be moderated by type of school was not. This was because ST appeared to operate only in the coed school. Taken together, results from the study seem to provide preliminary evidence to suggest that ST has a negative impact on the performance of highly mathematics-identified young Ugandan women in coed but not single-sex schools. One possible explanation for the absence of ST effects in the single-sex school and its presence in the coed school could be context related factors that were not assessed in this study.

Contextual Differences

Some contexts facilitate the activation of negative stereotypes better than others (Kray, Thompson, & Galinsky, 2001) and are therefore more likely to generate bigger ST effects. We conjecture that negative gender stereotypes about females in mathematics and the physical sciences are likely to be more salient in coed versus single-sex schools. Environments where such stereotypes are salient inadvertently become ST-ready. That is, they become fertile ground for ST to exert its impact when triggered. We contend that chronic exposure of girls and young women to such ST-ready environments have the potential to make girls susceptible to ST by (a) making gender stereotypes more easily accessible (and possibly believable) to girls and young women, thereby activating ST in the process, and (b) acting as an incubator for girls and young women in these contexts to adapt dispositional factors (e.g., stigma consciousness) over a period of time, which catalyze ST and subsequently degrades performance.

Stereotype accessibility. We conjecture that chronic exposure to negative stereotypes makes gender stereotypes more readily accessible for young women in coed schools as opposed to their single-sex school counterparts, which we surmise would strengthen the effects of ST. The literature supports the notion that gender stereotypes are more easily accessible to young women in coed versus single-sex learning environments (Kessels & Hannover, 2008).

Kessels and Hannover (2008) tested the hypothesis that girls' efficacy in physics was due to lower accessibility of related gender stereotypes of girls and young women in these domains. A total of 401 eighth-grade students from coeducational comprehensive schools were randomly assigned to single-sex versus coeducational physics classes for an entire academic year. Two months before the end of the academic year, implicit attitude tests modeled after Nosek, Banaji, and Greenwald's (2002) implicit tests on stereotype endorsement were used to evaluate the accessibility of gender stereotypes. Response latencies (measured in milliseconds) were used to capture stereotype accessibility. Results showed that girls in coed classes responded faster to feminine traits than to masculine ones, suggesting that gender traits were more accessible in coeducational classes than in single-sex classes. The reverse was true for girls in single-sex classes. Further, results from their study indicated a significant correlation between stereotype accessibility and physics self-concept among young women. That is, less accessibility of gender stereotypes led to an improvement in physics self-efficacy at the end of the year and vice versa. Additionally, young women from single-sex physics classes reported higher physics self-efficacy than did young women from coeducational classes.

Previously, empirical studies that highlighted the relatively strong, negative bias in the attitudes of teachers and boys and young men toward girls and young women in mathematics and the sciences in some African settings were reviewed. Although male students thought female students did not have the brainpower to pursue such masculine subjects, teachers, in addition to endorsing such beliefs, also believed that it was their duty to steer girls and young women toward domains that were more gender appropriate. Taken together, the cognitive and affective reactions towards girls and young women expressed by teachers and male students could potentially be reinforced in male–female student interactions, or even teacher–student interactions. By all accounts, such attitudes and interactions put girls and young women in coed schools in an environment in which gender stereotypes pertinent to mathematics and the sciences are habitually expressed either implicitly or explicitly. Hence it would appear that exposure to such messages on a consistent basis would increase accessibility of negative gender stereotypes among girls and young women, subsequently making it easier for ST to be triggered.

Adaptation of ST-conducive dispositional factors. Research has shown that ST is moderated by gender identification (Schmader, 2002) and gender stigma consciousness (Brown & Pinel, 2003). Generally girls who identify strongly with their gender and those who are conscious about and sensitive to negative gender stereotypes have been shown to perform significantly worse than girls for whom the reverse is true. This is because high levels of stigma consciousness make an individual more sensitive to environmental cues suggestive of negative stereotypes (Schmader, Johns, & Forbes, 2008), in contexts in which an individual's ability in the domain is being evaluated, such as test-taking situations. We hypothesize that individual differences in stigma consciousness are based at least partially on context. That is, girls who are chronically exposed to stereotype-salient environments over a long period of time are more likely to adopt and exhibit higher levels of stigma consciousness related to girls' abilities in supposedly male domains. To that end, we argue that single-sex school environments are likely to be less intellectually threatening and that females in these schools are less likely to suffer chronic exposure to negative gender stereotypes compared with their coed counterparts. Particularly, differential treatment of boys and girls by teachers, suggesting differential ability in mathematics and the sciences would be generally absent in a single-sex school. Hence the accessibility of negative gender stereotypes and consequently the heightened sensitivity to environmental cues signaling threat are likely to be limited. So with respect to this study, a one-time cue of ST through priming would not have been sufficient to elicit change in performance for young women at a single-sex school because the threat associated with negative stereotypes would have been probably either mild or not activated at all. On the other hand, we posit that young women in coed schools are more prone to suffer chronic exposure and as a result have a more heightened sensitivity to gender stereotypes. As such, higher levels of stigma consciousness, coupled with the presence of young men in the experimental condition, could have been sufficient to trigger ST and affect performance of these young women.

Limitations and Future Research

The present study had limitations that temper the interpretation of the findings herein. First, the sample in the present study was highly selective at the school and individual levels. Both schools were boarding schools, ranked in the top 10 secondary schools in Uganda. Also, the demographics of students in both schools could be described as generally high-achieving students from affluent (i.e., middle class to high SES) backgrounds. Further, of this demography, the students who returned to participate in the second phase of the study (the mathematics test) all strongly identified with mathematics. The restricted range of the sample therefore limits the scope and interpretation of ST to this demography of young Ugandan women. That is, high-achieving, highly mathematics-identified Ugandan students from middle- to upper-class backgrounds.

Coupled with the highly selective nature of the sample, the fact that this investigation is the first (to the best of our knowledge) to examine ST effects in African cultural settings precludes us from generalizing findings to other girls and young women in Uganda or other non-Western cultural settings. Much more research is needed, particularly replication studies with more heterogeneous samples at the school and individual levels, before arriving at any sort of generalization regarding ST effects in coed and single-sex schools in similar cultural settings.

Another limitation of this study was the small sample size, which subsequently attenuated power. Given the consistency of the differences observed between conditions and schools with the general trend in existing ST research, we would expect the statistically significant effects reported in this study to be magnified under conditions of higher power. Finally, the present study was limited in that stigma consciousness and gender identification were not measured directly. As such, individual differences between young women in the coed and single-sex schools on these dispositional factors can only be inferred and not ascertained. This information would have bolstered our theories on differences in the effect of ST on young women in the different types of schools.

To the best of our knowledge, this is the first study to explore ST in Uganda. The results suggest that, similar to their western counterparts, young women in Uganda are susceptible to underperformance under ST conditions. The participants in the study were high SES, highly mathematics-identified young Ugandan women attending prestigious schools. This provides a fairly rigorous test of the existence of ST as a phenomenon in Uganda, as the literature would suggest an even more pronounced effect had the sample included young women from the entire SES spectrum. Although this study does contribute to the understanding of ST as a phenomenon in other cultures, the Ugandan cultural setting is only one of many. Considerable work remains to determine the existence of ST in other cultures. Perhaps Hofstede's (1980), masculinity–femininity dimension of cultures could provide a point of departure for examining ST elsewhere in the world.

The results also seem to indicate that the impact of ST was strongly attenuated for young women in the single-sex school as opposed to their coed counterparts. Although the performance advantages of single-sex schools are well documented (cf. Van der Gaer et al., 2004), little is understood regarding the mechanisms by which those advantages occur. Although certainly not a complete explanation, it would seem that the attenuation of the effects of ST may be at least partially responsible for why girls and young women in same-sex schools fare better in what are thought of as traditionally male-dominated subjects than their coed counterparts.

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NOTE

1. St. Mary's College Kisubi is the equally competitive, all-boys counterpart to the all-girls school from which the research participants were drawn.

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APPENDIX A
Math Achievement Exam

1. Solve the equation: $x^5 - 34x^3 + 225x = 0$.

   A) x = 0 or 3 or 5 B) x = −3 or −5 or 0 or 3 or 5 C) x = 0 or −3 or −5 D) −3 or −5 or 3 or 5.

2. Given the representative fraction of a map is 1/250,000 find the area of a lake in km^2 which is represented on the map by the area of 4.6 cm3

   A. 28.7 km^2 B. 2887.5 km^2 C. 2875 km^2 D. 2870 km^2

3. The numbers c, g, h and v (where g ≠ 0) are connected by the formula $v^2 - gh = g\sqrt{}(c^2 + h^2)$. Express h in terms of v, g and c.

   A) $h = \frac{(V^4 - g^2c^2)}{V^2g}$ B) $h = \frac{V^2 - g^2c^2}{2Vg}$ C) $h = \frac{V^4 - g^2c^2}{2V^2g}$ D) $h = \frac{V^2 - g^2c^2}{2V^2g}$

4. If P: Q = 5 : 3 and Q = 12.6 then P is :-

   A) 6.3 B) 7.56 C) 21 D) 14.6

5. A train traveling 30 miles/h is stopped 2 1/2 miles from its destination at 2:00 pm. At what time would the train arrive if it had not been delayed?

   A) 2:04 pm B) 2:05 pm C) 2:065 pm D) 2:30 pm

6. Given $\log_{10}X = 2.8520$ and $\log_{10}Y = 2.8520$ use tables to evaluate $\frac{x^{1/2}}{y}$. Correct to 3s.f

   A) 2.574 × 102 B) 3.749 × 102 C) 3.75 × 102 D) 3.75 × 101

7. A law of proportion connects the quantities x and y in this table.

x	1	2	4	5	6
y	0.5	2.0	8.0	*	18.0

   What is the value of y corresponding to x = 5?

   A) 2.5 B) 10 C) 12.5 D) 25

8. A rectangular container measuring 15 cm by 12 cm contains water to a depth of 10 cm. Find the new height of the water in the container if 1.08 litres of water are drawn from the container.

   A) 4 cm B) 9.994 cm C) 9.94 cm D) 40 cm

9. A man with 120 cattle bought enough food for them for 35 days. He then immediately sold 15 of the cattle. He had enough food to last the remaining cattle how many days?

   A) 30 days B) 32 days C) 24 days D) 40 days

10. One year, a factory granted raises at three different times. If 62% of the workers received raises in the first and second periods and 10% of these did not receive a raise in the third period, what percentage of the workers received raises in all the three periods?

    A) 6.2% B) 38% C) 52% D) 55.8%

11. The bases of 2 vertical towers are separated by a distance of x meters, their heights differ by 11 metres and the shortest distance between there tops is 61metres. Find the value of x.

    A) 61m B) 3600 C) 62 D) 10.4

(Continued on next page)

APPENDIX A *(Continued)*

12. A line passing through the points A (−1, 3k) and B (k, 3) is parallel to the line whose equation is $2y + 3x = 9$. Write down the coordinates of A and B.
    A) A(−1, 3); B (1/3, 3) B) A (−1, 33); B (11, 3) C) A (−1, 9); B (3, 3) D) A (3, 3); B (−1, 9)

13. The mean weight of a class of 30 boys is x kg. When 2 boys with total weight of 150 kg are absent, the min weight of those present is 2 kg less than the min weight of the whole class. Find the value of x.
    A) 94 kg B) 60 kg C) 47 kg D) 23 kg

14. Solve for y: $\frac{2-3y}{5} < y + 2$
    A) $y = -8$ B) $y = 8$ C) $y > -8$ D) $y< = -5/y$.

15.
    A
    B C
    P Q
    The area of triangle APQ is 99 cm^2 and the area of triangle ABC is 11 cm^2. If PQ is 12 cm, calculate BC
    A) 9 B) 3 C) 4 D) 12

APPENDIX B
Descriptive Statistics for the Pre-experiment Questionnaire

TABLE B1. Descriptive Statistics of Composite Scores on Mathematics Identification and Self-Efficacy Scale ($N = 89$)

Subscale	α	M	*SD*	Median	Mode	Skewness	Kurtosis
Mathematics identification	0.40	4.36	1.47	4.00	5.00	−0.36	−0.26
Mathematics self-efficacy	0.86	6.10	0.94	6.00	7.00	−0.71	−0.53

TABLE B2. Item Means and Standard Deviations for the Mathematics Identification and Self-Efficacy Scale

	M	*SD*
My math abilities are important to me.	6.45	1.08
Compared to other students my age, I am good at math.	4.17	1.89
I don't care at all if other people believe I am good at math.	4.07	2.05
I get good grades in math.	3.54	1.96
Math abilities will be very important to me in my future career.	6.18	1.53
I'm helpless when it comes to math.	2.39	1.95
I've always done well at math.	3.56	1.89
Math abilities are not important to my success at school.	1.46	1.06
Work in math classes is easy for me.	4.86	1.79
I do not learn things quickly in math.	3.75	2.02