

Effects of Stereotype Threat on Simple and Complex Math Tests

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### Abstract

Stereotype threat is the risk of confirming a negative stereotype of one's group as being accurate of oneself. An individual from a negatively stereotyped group attempts to disconfirm the stereotype, which in turn increases cognitive load and decreasing working memory, causing errors in responses on complex tasks. These cognitive miscalculations manifest as impaired learning, stunted intellectual development, and underperformance in testing, with decreased motivation and low self-esteem. Mere effort theory posits that if a task is cognitively easy, then the drain on cognitive load and working memory decreases, allowing for better performance. As a person from any group may be subjected to stereotype threat, understanding ways to mitigate stereotype threat and improving learning and performance is beneficial to all individuals and groups. The premise of this research paper is to examine the possibility of attenuating stereotype threat by introducing first a cognitively simple math test, followed by a more cognitively challenging math test. The intention being that by having participants first complete a simple math test, they will have more confidence and be more motivated to perform well on the second, more complex test. The hypotheses were not confirmed; however, there was significant interaction between the simple and complex math test types and the order in which the tests were performed.

*Keywords:* stereotype threat, race, gender, cognitive load, working memory, math tests

### Effects of Stereotype Threat on Simple and Complex Math Tests

Stereotype threat, as defined by Steele and Aronson (1995), is the risk of confirming a negative stereotype of one's group as being accurate of oneself. The person belonging to the stereotyped group may perceive to be identified and judged according to the negative stereotype and thus feel threatened by the association (Steele, 1997; Steele & Aronson, 1995). Stereotype threat harms performance through various physiological and psychological mechanisms (Schmader, Johns, & Forbes, 2008; Taylor & Walton, 2011). The purpose of this experiment is to ascertain whether manipulating certain physiological or psychological processes can mitigate stereotype threat effects on simple and complex math test performance.

#### **Stereotype Threat**

Blacks are intellectually inferior (Steele & Aronson, 1995); Whites are inferior in sports performance (Stone, Perry, & Darley, 1997); females underperform in the science, technology, engineering and mathematics (STEM) disciplines (Shaffer, Marx, & Prislin, 2013); White men are superior in math and spatial skills (Picho, Rodriguez, & Finnie, 2013), and Blacks are superior in sports performance (Stone et al., 1997) – these statements express stereotypes. Stereotypes exist and the deleterious effects of stereotype threat have been rigorously researched (Schmader et al., 2008; Steele, 1997; Steele & Aronson, 1995; Taylor & Walton, 2011). Stereotype threat is a situational occurrence and research has shown that though people may not be consciously aware of stereotype threat in a given situation, they tend to react in a conditioned fashion, as the threat is linked to representations of situations where experiences of stereotypes and attitudes are automatically activated (Bargh, Chen, & Burrow, 1996; Chalabaev, Sarrazin, Fontayne, Boiché, & Clément-Guillotin, 2013; Inzlicht & Schmader, 2011; Spencer, Steele, & Quinn, 1999).

In their classic study, Steele and Aronson (1995) found that making ability salient to Black students decreased their performance on tests. Test performance also declined when, prior to testing, Black racial identity was primed. Participants who were primed scored 42.8% lower than those who were not primed, and those who were primed were significantly more anxious ( $M = 48.5$ ) than those who were not ( $M = 40.5$ ) (Steele & Aronson, 1995). Taylor and Walton (2011) determined that stereotype threat not only affected the acquiring of academic knowledge, but also the retrieval of academic knowledge. In an experiment using Black and White student participants, Black students outperformed White students by 11%, in a nonthreatening environment. The researchers primed a learning-threat environment by advising participants a test based on verbal reasoning abilities was a valid measure of verbal capabilities, and advised the participants that the test assessed any verbal limitations (Taylor & Walton, 2011). When tested in the learning-threat environment, Black students underperformed compared to their performance in the nonthreatening condition and White students outperformed Black students by 25%. Interestingly, White students also improved their percentage correct from the nonthreatened to the learning-threat condition by 20%. The White students performed better overall in the learning-threat environment, while the Black students underperformed (Taylor & Walton, 2011). To explain this phenomenon, stereotype lift theory posits that those who are not the target of a stereotype threat benefit from comparisons to those stereotyped to be inferior (Spencer et al., 1999; Steele & Brown, 1998; Walton & Cohen, 2003).

For females, much research confirms the relationship between stereotype threat and underperformance on math tests. Spencer et al. (1999) explained that the mere sitting down to a math test makes salient the extra burden of being female, thereby invoking the threat. O'Brien and Crandall (2003) confirm this theory, as their study of women and math tests showed that

women experiencing stereotype threat scored worse on an easy math test ( $M = .20$ ) and worse on difficult math test ( $M = -.64$ ), than women who were not exposed to the stereotype threat prime (easy test  $M = .25$ , difficult test  $M = .17$ ). Consistent with the findings of Nguyen and Ryan's (2008) meta-analysis, Picho et al. (2013) and Walton and Cohen's (2003) research of females and stereotype threat concluded that females in stereotype threat situations performed worse than males and worse than females not experiencing stereotype threat. Flore and Wicherts (2015), in their meta-analysis of 15 years of stereotype threat literature, confirmed comparable results, that due to stereotype threat, female children and female adolescents underperformed in math, science and spatial skill tests. Consequently, not only does stereotype threat damage female performance on various academic tests, but it also reduces motivation to improve and harms self-esteem (Fogliati & Bussey, 2013).

### **Cognitive Load and Working Memory**

Cognitive load, as described by Sweller (1988), is the amount of mental effort needed to operate working memory. Cognitive load availability is an important factor during problem solving and is affected by selective attention (Sweller, 1988). Working memory, as described by Baddeley (1992), is a brain system that temporarily holds and manipulates information necessary for cognitive tasks and is associated with, but not limited to reasoning intelligence and reading comprehension. Barrouillet, Bernardin, Portrat, Vergauwe, and Camos (2007) posit that working memory, as it has limited capacity, suffers when attention is switched from the intended task of attention to other concurrent activities. Attention capacity is required for the use of retrieval strategies to bring encoded information into working memory (Schelble, Therriault, & Miller, 2012). Cognitive load and in turn, working memory, are sensitive to different brain networks operating either simultaneously or consecutively, such as the visual and auditory domains, and

these domains affect memory encoding (Li, Christ, & Cowan, 2014). Sörqvist, Stenfelt and Rönnerberg (2012) note the processing of irrelevant information decreases under high working memory load if attention is focused only on one task; however, if two tasks are competing for attention, one task takes up the working memory resources and the other task suffers, as no working memory resources are allocated to the performance of that task. When cognitive load increases, some people exhibit the phenomenon of “choking under pressure” because of the stress on working memory resources associated with increased cognitive load (Schelble et al., 2012). This phenomenon may be associated with stereotype threat.

### **Stereotype Threat and Cognitive Load**

Various research has examined the effects of increased cognitive load interacting with stereotype threat. Results have confirmed underperformance in academic tasks, such as math tests, due to this interaction (Schmader et al., 2008; Steele & Aronson, 1995). Frustration, as a result of stereotype threat, can interrupt performance in various ways, by increasing arousal, diverting attention with worry, interfering with self-consciousness or causing one to become overly cautious (Steele & Aronson, 1995). Any of these phenomena can contribute to underperformance on tasks requiring increased use of cognitive load (Steele & Aronson, 1995). Stereotype threat produces physiological stress and negative mood conditions, which can impede task performance (Steele & Aronson, 1995). If a task is difficult, causing a physiological response beyond the optimum level of arousal (Yerkes & Dodson, 1908), it will undermine performance, as it becomes difficult to retrieve the proper responses (O’Brien & Crandall, 2003). Stereotype threat hinders performance by interfering with the working memory capacity available for information-processing requirements (Schmader et al., 2008). During difficult tasks (e.g., SAT math test), individuals perceiving stereotype threat are in a higher state of arousal and

underperform (O'Brien & Crandall, 2003; Spencer et al., 1999; Steele & Aronson, 1995).

Because stereotype threat takes attention away from the task-at-hand, as attention is focussed on preventing or eliminating the threat, it increases cognitive load, leaving less working memory resources to perform the intended task (Barber & Mather, 2013).

Stereotype threat theory maintains that one who perceives stereotype threat works to disconfirm the stereotype, specifically, increasing the use of cognitive load resources and using limited working memory resources (Barber & Mather, 2013). Mere effort theory, however, posits that in situations where one is experiencing stereotype threat, one has motivation to do well to disprove the stereotype, but has difficulty achieving success in situations where tasks require all available cognitive resources, which are diverted to counter the threat (Jamieson & Harkins, 2007; Harkins, 2006). However, Jamieson and Harkins (2007) noted that performance improves if a task is a well thought out procedure or is cognitively easy. Moreover, O'Brien and Crandall (2003) observed that if a task was simple or well-learned, it would lead to an increase in correct or appropriate responses, thereby bolstering performance. In one study, Beilock, Jellison, Rydell, McConnell, and Carr (2006) distracted individuals by introducing a secondary task, which attenuated the effect of stereotype threat on the performance of a well-honed skill (golf putting), by diverting attention away from the threat. However, the researchers emphasized that in situations where skill was not so perfected, increased cognitive load decreased performance. A novel study by Smeding, Dumas, Loose, and Régner (2013), found that girls who completed a math test prior to a verbal test performed worse ( $M = 50$ ) on the math test than boys ( $M = 54$ ) who tested in the same order; however, when the test order was reversed, girls ( $M = 54$ ) scored better on the math test than the boys ( $M = 52$ ). Girls' math scores were also higher on the math test that followed the verbal test ( $d = .28$ ). The researchers considered these findings a result of

the girls perceiving the verbal test as nonthreatening. Consequently, stereotype threat is a contradiction in that it motivates to perform well, while simultaneously increasing cognitive load, which decreases actual performance, especially as it pertains to complex tasks; however, simple or well-honed tasks may not excessively tax cognitive load and working memory, and subsequently not hinder performance (Jamieson & Harkins, 2007).

### **Overview and Hypotheses**

Obvious implications of stereotype threat include the harmful consequences on academic learning and performance. As previously discussed, certain groups are underperforming in school settings and underperforming on math tests (Nguyen & Ryan, 2008; Steele, 1997; Steele & Aronson, 1995); therefore, it is necessary to understand how and why stereotype threat manifests and what psychologists can do to assist those who experience stereotype threat. As exploration of stereotype threat theory continues, researchers are examining ways to attenuate its effects. Mere effort theory distinguishes between simple and complex cognitive processes in task response, as those who experience stereotype threat are motivated to do well, yet during complex tasks may respond incorrectly, but during simple tasks perform better (Harkins, 2006; Jamieson & Harkins, 2007; O'Brien & Crandall, 2003). However, no study has examined whether it is possible to attenuate stereotype threat by introducing a simple cognitive task immediately prior to a complex cognitive task. A simple cognitive task may lessen frustration, divert attention from the threat and decrease cognitive load, thereby freeing up working memory to attend to the necessary task (Steele & Aronson, 1995). Introduction of a simple cognitive task may afford a chance of success, thereby increasing motivation (Harkins, 2006; Jamieson & Harkins, 2007). The premise of this research is to examine whether the introduction of a simple task immediately prior to a complex task will attenuate stereotype threat. Math test scores are scrutinized, while



controlling for the stereotype threat groups of race and gender, and simple and complex math tests.

Hypotheses:

- 1) That participants who complete a simple math test first will score higher on a complex math test than participants who complete a complex math test first,
- 2) That stereotype threat-primed participants will score higher on a simple math test, but score lower on a complex math test, compared to participants in the nonprimed group,
- 3) That stereotype threat-primed participants, who complete first a simple math test, then complete a complex math test will score higher on the complex math test than the stereotype threat-primed participants who complete a complex math test first, followed by completion of a simple math test.

## **Method**

### **Design**

This study utilized an experimental 2 x 2 x 2 mixed factorial design, with a nonrandom sample of participants. Analysis of variance (ANOVA) was used for data analyses. The factors consisted of threat condition – stereotype threat prime or nonprime; test type – simple or complex, and order of tests received, either simple / complex (S/C) or complex / simple (C/S). The dependent variable was the scores on the simple and complex math tests.

### **Participants**

A convenience sample of 36 Mount Saint Vincent University (MSVU) undergraduate students (34 female, 2 male) from introductory psychology classes were recruited. Participant ages ranged from 18 – 44 years ( $M_{age} = 20.5$ ,  $SD = 5.3$ ). Demographic information identified participants as predominantly of the White race ( $White = 75\%$ ,  $First Nations = 2.8\%$ ,  $Black /$

*African Canadian* = 8.3%, *Other* = 13.9%). Participants were randomly assigned to the experimental prime group ( $N = 20$ ) or the control nonprime group ( $N = 16$ ), randomly assigned to order of test received ( $S/C = 16$ ,  $C/S = 20$ ) and all participants completed both the simple and the complex math tests. Some participants were offered participation credit from their instructors.

## **Materials and Apparatus**

### **Stereotype Threat Prime**

A White Euro-Canadian adult male audio-recorded a moderately explicit (Flore & Wicherts, 2015; Nguyen & Ryan, 2008) stereotype threat prime (Tine & Gotlieb, 2013) (see Appendix A), which was played for the experimental group. The use of a moderately explicit prime was based on the results of a meta-analysis of stereotype threat and the effects on women and minorities on math test performance. Nguyen and Ryan (2008) explored the consequences of using blatant, moderate and subtle cues to invoke stereotype threat. Their findings showed that when the negative stereotype was based on race, the largest effect size was created using moderately explicit threat cues ( $d = .64$ ) as opposed to blatant ( $d = .40$ ) and subtle cues ( $d = .20$ ). Though they observed a different pattern for female stereotype threat, the differences in effect size were insignificant between the three levels – blatant ( $d = .17$ ), moderate ( $d = .18$ ) and subtle ( $d = .24$ ). Given the proficient effect of the moderate prime, the use of a moderately explicit stereotype prime for this study was suitable.

### **Demographics**

Demographic information (see Appendix B), such as age, race, and sex was collected. For those in the prime group the information was collected prior to testing, to increase the threat

and for those in the nonprime group the information was collected after testing, to make the threat minor in consequence.

### Math Tests

Four categories of math tests (see Appendix C) in booklet form were counterbalanced and randomly assigned, as follows:

Prime Simple / Complex Test (PSC)

Prime Complex / Simple Test (PCS)

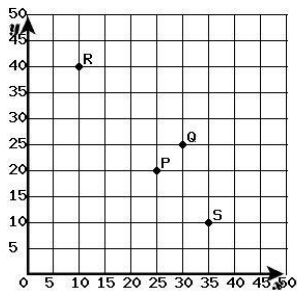
Nonprime Simple / Complex Test (NPSC)

Nonprime Complex / Simple Test (NPCS)

The simple test type consisted of 20 randomly chosen questions, assessed with a junior high school difficulty rating (Alberta, 2003).

Sample question from simple test type:

4. Brittney created a graph to show 4 points. Where is Point R located?

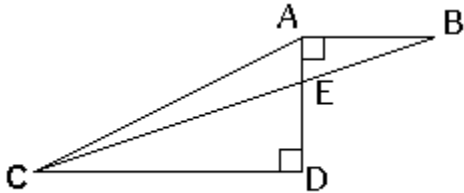


- A (30, 25)                       B (10, 40)
- C (35, 10)                       D (25, 20)

The complex test type consisted of 20 randomly chosen questions, with SAT College Admission Exam difficulty rating (SAT, 2015).

Sample question from complex test type:

9.



In the figure above  $AD = 4$ ,  $AB = 3$  and  $CD = 9$ . What is the area of triangle AEC?

- A. 18
- B. 13.5
- C. 9
- D. 4.5
- E. 3

The format for the test types was multiple-choice, and scoring was as follows:

- received one point for each correct answer
- deducted one point for each skipped or unanswered question
- deducted .25 for each incorrect 4-part multiple-choice answer
- deducted .20 for each incorrect 5-part multiple-choice answer.

Multiple-choice answer scoring was adjusted for possible guessing effects (Fogliati & Bussey, 2013; Spencer et al., 1999). For comparison purposes, raw data scores were transformed to

standardized z-scores. Participants did not use calculators or any type of technology to assist in calculations.

### **Procedure**

During a prearranged scheduled time, participants were met by the researcher at an MSVU classroom and were provided an informed consent form (see Appendix D). Participants who agreed to participate signed the informed consent form and were randomly assigned to one of the four designated groups: 1) PSC, 2) PCS, 3) NPSC, and 4) NPCS. Participants received a pencil, scrap paper and the appropriate tests booklet, and were asked not to open the booklet until requested. Primed participants were then asked to follow along in their booklet, as they heard the audio recording of the stereotype threat prime:

The following passage explains the reasons why we are doing this study...

We are interested in understanding how students perform on math tests, and, particularly, what causes some students to perform better in math than other students. As you know, math skills are important for doing well in many subject areas in university and are important in the career choices we make. Unfortunately, however, there are systematic differences in math performance among students because of their race and there are math performance differences between males and females.

Surprisingly, little is known about the mental processes underlying math performance that explain why there are differences in the groups of race and gender. By doing this experiment we want to better understand why certain race and gender-based groups underperform on math tests.

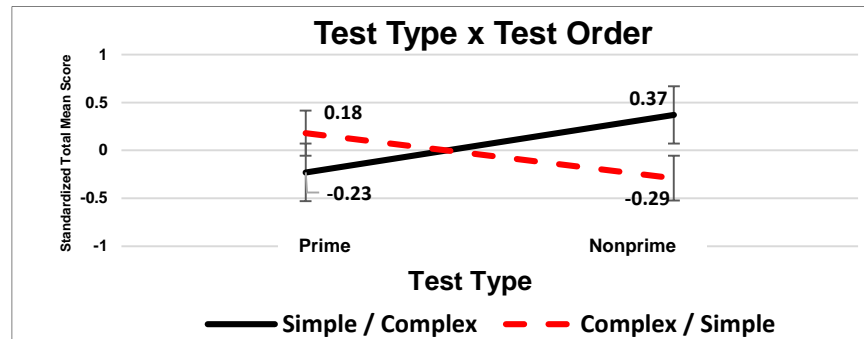
Please turn to the next page in your booklet and complete the demographic information. Once completed, please close your booklet.

Prime participants then provided demographic information on the next page, and were instructed to close their booklets. Nonprime participants recorded their demographic information after the completion of both tests. After the demographic information was recorded, participants were advised they had 10 timed minutes to complete each test and advised of the scoring scheme. Participants were instructed not to use calculators or any type of assisting technology, but the scrap paper provided could be used to perform calculations. Participants were asked to stay for the total testing time, regardless of if they finished early (see Appendix E for instructions). Prime participants were debriefed after the testing session (see Appendix F). This procedure for the research sessions did not take more than 30 – 40 minutes.

### Results

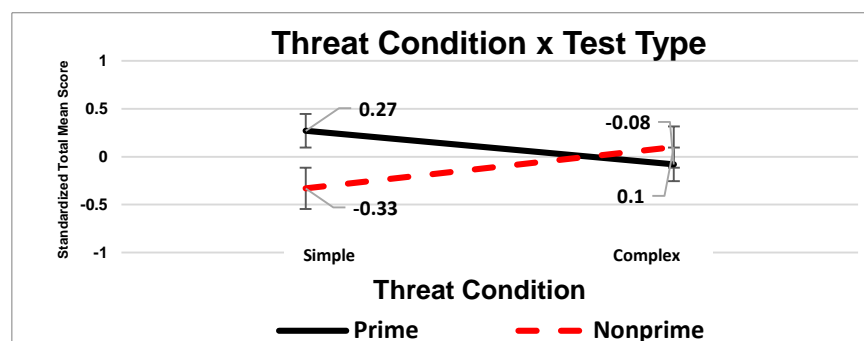
1) The hypothesis that participants who complete the simple math test first will score higher on the complex math test than participants who complete the complex math test first was not confirmed (simple test – S/C –  $M = -.23$ ,  $SD = .97$ , C/S –  $M = .18$ ,  $SD = 1.01$ ; complex test, S/C –  $M = .37$ ,  $SD = 1.19$ , C/S –  $M = -.29$ ,  $SD = .71$ ), (see Appendix G for means and standard deviations Table 1). To examine the effects of test type (simple or complex) and test order (simple or complex first), a 2 x 2 ANOVA was conducted. There was no evidence of a significant main effect of test type, ( $F(1) = .098$ ,  $p = .757$ ,  $\eta_p^2 = .003$ ) or test order ( $F(1) = .233$ ,  $p = .633$ ,  $\eta_p^2 = .007$ ) (see Appendix H for ANOVA source Table 2). However, there appeared to be evidence of a significant interaction between test type and test order,  $F(1, 1) = 7.900$ ,  $p = .008$ ,  $\eta_p^2 = .189$ ), indicating that the type of test and the order of receiving the tests had an effect on test scores, as shown in Figure 1:

Figure 1. Interaction of Test Type x Test Order



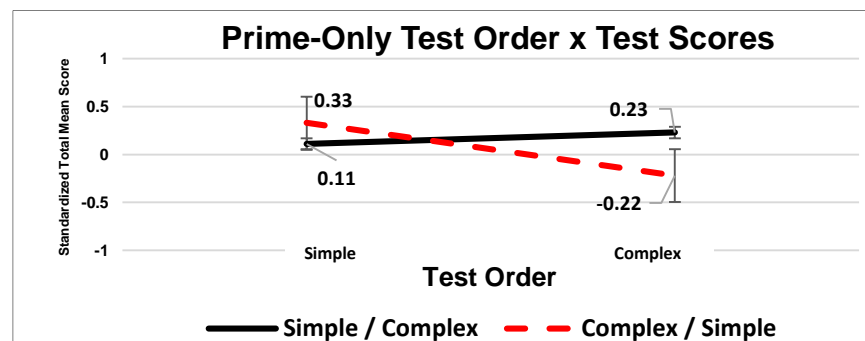
2) The hypothesis that prime participants will score higher on the simple math test, but score lower on the complex math test, compared to participants in the nonprime group, was not confirmed (simple test –  $P - M = .27$ ,  $SD = .81$ ,  $NP - M = -.33$ ,  $SD = 1.14$ ; complex test,  $P - M = -.08$ ,  $SD = .88$ ,  $NP - M = .10$ ,  $SD = 1.16$ ), (see Appendix I for means and standard deviations Table 3). To examine the effects of threat condition (prime or nonprime) and test type (simple or complex), a 2 x 2 ANOVA was conducted. There was no evidence of a significant main effect of test type ( $F(1) = .047$ ,  $p = .829$ ,  $\eta_p^2 = .001$ ), or threat condition ( $F(1) = .601$ ,  $p = .443$ ,  $\eta_p^2 = .017$ ) (see Appendix J for ANOVA source Table 4). However, though statistically there appeared to be no evidence of a significant interaction between threat condition and test order ( $F(1, 1) = 3.831$ ,  $p = .059$ ,  $\eta_p^2 = .101$ ), a trend may be occurring between the interaction of threat condition and test type, as shown in Figure 2:

Figure 2. Interaction of Threat Condition x Test Type



3) The hypothesis that prime participants, who complete first a simple math test, then immediately complete a complex math test, will score higher on the complex math test than the prime participants who complete a complex math test first followed promptly by completion of a simple math test, was not confirmed (S/C simple test –  $M = .11$ ,  $SD = .34$ , complex test –  $M = .33$ ,  $SD = .22$ ; C/S simple test –  $M = .23$ ,  $SD = .36$ , complex test –  $M = -.22$ ,  $SD = .36$ ) (see Appendix K for means and standard deviations Table 5). To examine the effects of prime-only test type (simple or complex) and prime-only test order (simple or complex first), a 2 x 2 ANOVA was conducted. There was no evidence of a significant main effect of prime-only test order ( $F(1) = .105$ ,  $p = .749$ ,  $\eta_p^2 = .006$ ), or prime-only test type ( $F(1) = .786$ ,  $p = .387$ ,  $\eta_p^2 = .042$ ) (see Appendix L for ANOVA source Table 6), for the prime participants. Though the prime participants who performed the simple test first outscored the prime participants who completed the complex test first, there was no evidence of significant interaction ( $F(1, 1) = 1.896$ ,  $p = .185$ ,  $\eta_p^2 = .095$ ).

Figure 3. Interaction of Prime-Only Test Order x Test Scores



4) Though this study was originally designed as a 2 x 2 mixed factorial design, data analyses revealed a 2 x 2 x 2 mixed factorial model, as the independent variable of test type had not been initially taken into consideration. As such, a three-way analysis of interaction between threat condition, test order and test type has been performed (see Appendix M for means and



standard deviations Table 7). Analysis revealed no evidence of a main effect of threat condition ( $F(1) = .891, p = .352, \eta_p^2 = .027$ ), test order ( $F(1) = .619, p = .437, \eta_p^2 = .019$ ) or test type ( $F(1) = .032, p = .858, \eta_p^2 = .001$ ). However, as discovered in the previous 2 x 2 analysis, evidence of an interaction between test type and test order was significant in the three-way ANOVA ( $F(1, 1) = 5.254, p = .029, \eta_p^2 = .141$ ), as well. There was no evidence of significant interaction between threat condition and test type ( $F(1, 1) = 1.548, p = .222, \eta_p^2 = .046$ ), threat condition and test order ( $F(1, 1) = .163, p = .689, \eta_p^2 = .05$ ), or threat condition, test type and test order ( $F(1, 1, 1) = .409, p = .527, \eta_p^2 = .013$ ).

### Discussion

Consistent with stereotype threat theory (Steele, 1997), research has provided evidence that stereotype threat exists for those associated with negatively stereotyped groups (Deaux et al., 2007; Fiske et al., 2002; Steele, 1997; Steele & Aronson, 1995). The purpose of this study was to illuminate strategies to assist those who experience stereotype threat, by enhancing success during complex task performance. The premise of mere effort theory, that a simple task may mitigate stereotype threat when performed simultaneously with a cognitively complex task (Harkins, 2006; Jamieson & Harkins, 2007), was altered to observe if consecutive simple and complex cognitive tasks might attenuate stereotype threat. Statistical evidence did not bear out the hypotheses proposed and there are several aspects to consider in evaluating why. Though there was significant interaction between test type and test order, there was no other evidence of significant interaction or main effect; therefore, the measures used in the study were scrutinized. Previous research has shown the use of the Graduate Record Examination (GRE) (ETS, 2015) as the benchmark for the complex cognitive task (Aronson et al., 1998; Fogliati & Bussey, 2013;

Jamieson & Harkins, 2009; Johns, Schmader, & Martens, 2005; Picho et al., 2013). In pretesting 20 sample math questions from the GRE, it was found that the GRE questions were too difficult for a sample of third-year undergraduate students ( $N = 9$ , 9% correct), and the simple math test, which consisted of 20, 3-digit x 3-digit multiplication questions (Lester, 2006; O'Brien & Crandall, 2003), was too difficult ( $N = 9$ , 27% correct), as well. Therefore, simple and complex math tests were revamped for the experiment, without the advantage of an extensive pretest, due to time constraints. Cronbach's alpha showed the internal reliability of the tests: simple math test –  $r = .79$ , complex math test –  $r = .58$ , thus affecting the validity of the experiment. Better measures, such as more reliable, pretested, simple and complex cognitive tasks may provide different results in future experiments.

Though designed to be moderately effective, the stereotype threat prime may have been too strong. The passage was designed to make salient race and gender stereotypes, but on a level that did not provoke the “prove-them-wrong” syndrome, a framework explaining persistent characteristics developed as coping mechanisms in the face of adversity (Nguyen & Ryan, 2008; Smith, 2003). In this syndrome, the test taker consciously overperforms in a phenomenon known as stereotype reactance effect, whereas those who are aware of a blatant stereotype threat react in ways that successfully counter the threat (Kray, Thompson, & Galinsky, 2001; Nguyen & Ryan, 2008). This differs from confirmation of the negative stereotype, as moderate threats may cause assimilation and underperformance, and blatant threats may produce the opposite effect of success, as test takers perceive a limit to their abilities, and perform in contrast to the negative stereotype (performing as if they have nothing to lose) (Kray et al., 2001; Nguyen & Ryan, 2008). Though the stereotype threat prime was audio recorded by a White male of European descent, the researcher herself was a mature Black female in a position of authority over the

participants. This may have introduced a confound into the study, as she was female, a person of the nondominant race, and influential. This scenario may have provided a boost to the predominantly female (94.44%) participants and participants of the nondominant race (25%). This experiment was intended to assess the performance of participants experiencing the stereotype threats of race (those of the nondominant / nonWhite races) and gender (females). However, the sample size was small ( $N = 36$ ) and the participants predominantly White, with 75% of the sample young ( $M_{age} = 20.5$ ), White females. As previously noted, females experience stereotype threat; however, in this testing situation, the majority of the testing groups were young White females only, with no other individuals from outgroups to influence their surroundings. Testing in this homogeneous group situation may have provided a “buffering” effect, whereas the performance of the participants was heightened because everyone in the group was the same and in the same situation, and memory performance was positively affected by the group dynamics (Austin, 2003; Shaffer et al., 2013). The combination of “prove-them-wrong,” coupled with ingroup favour, may have created a type of cognitive myopia (Hertwig & Hoffrage, 2013, p. 502), whereas these participants may have believed they could do better than anticipated, regardless of the predominant negative stereotype of their group. A larger and diverse sample may have provided more rigorous results.

Though the hypotheses were not confirmed, future studies are required in this important area of research; this topic is central to the success of many current and future students, as societies are becoming globally more heterogeneous (Nation, 2015). Stereotype threat is an issue concerning the performance of those who face this threat, and in Western society, it is more often women and individuals of the nondominant race (Deaux et al., 2007; Fiske et al., 2002; Steele, 1997; Steele & Aronson, 1995). Stereotype threat interferes with learning as well as performance

(Steele, 1997; Steele & Aronson, 1995). Stereotype threat presents implications for developing intellectual capacities, while enhancing the negative effects of stigmatization, due to poor performance (Taylor & Walton, 2011). An area of future research may look at measuring and comparing arousal level, cognitive load and working memory of those who experience stereotype threat and those who successfully perform under stereotype threat, as there is debate as to what mechanisms are affected by stereotype threat (Jamieson & Harkins, 2007). Schmader et al., (2008) propose it is working memory capacity, especially the area of executive function, which leads to poor working memory performance. Jamieson and Harkins (2007), positing mere effort theory, propose that moderating arousal levels allows individuals the capacity to correct an incorrect answer, once it is realized that an incorrect answer is given, is the key to mitigating the threat. Regardless of which physiological and psychological mechanisms mediate stereotype threat, researchers need to devise real world solutions, so that individuals have the best chance at academic and social success.

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## Appendix A

The following passage explains the reasons why we are doing this study...

We are interested in understanding how students perform on math tests, and, particularly, what causes some students to perform better in math than other students. As you know, math skills are important for doing well in many subject areas in university and are important in the career choices we make. Unfortunately, however, there are systematic differences in math performance among students because of their race and there are math performance differences between males and females.

Surprisingly, little is known about the mental processes underlying math performance that explain why there are differences in the groups of race and gender. By doing this experiment we want to better understand why certain race and gender-based groups underperform on math tests. Please turn to the next page in your booklet and complete the demographic information. Once completed, please close your booklet.

## Appendix B

*Sex: (select one)*

Male       Female

*Age: \_\_\_\_\_ (in years)*

*Race / Ethnicity: (select one)*

- Caucasian / White
- Asian
- Eastern Asian
- South Asian
- Indian
- Latino
- First Nations
- Aboriginal
- African Canadian / Black
- African
- Other \_\_\_\_\_

## Appendix C

## Simple Math Test

## Math Test 1 / 2

- *You will be given 10 minutes to complete this test.*
- *If you complete the test before the 10 minutes are finished, please put down your pencil and close your booklet.*
- *You may not use a calculator, but you can use the blank paper provided or you can solve the questions directly on this paper.*
  - *You will receive one point for each correct answer.*
  - *You will be deducted one point for each skipped or unanswered question.*
  - *For the multiple-choice questions, you will be deducted .25 points for each incorrect answer.*

1. Solve the following. Mark your answer.

$$130 + 129 =$$

A 279

B 159

C 259

D 529

2. Solve the following. Mark your answer.

$$333 \times 3 =$$

A 666

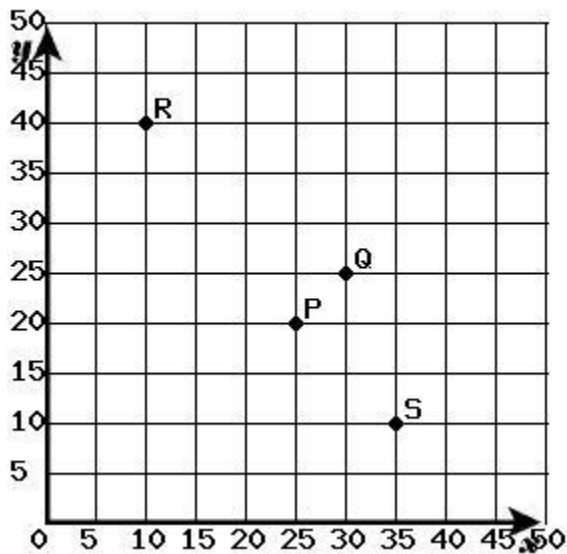
B 989

- C 656  D 999

3. Daniel's mother bought 2 bunches of lilies and 5 bunches of tulips. Each bunch of lilies has 12 lilies and each bunches of tulips has 9 tulips. What number sentence can be used by Daniel to find the total number of lilies and tulips? Mark your answer.

- A  $(2 + 5) \times 9$   B  $(2 \times 12) \times (5 \times 9)$   
 C  $(2 + 5) \times 12$   D  $(2 \times 12) + (5 \times 9)$

4. Brittney created a graph to show 4 points. Where is Point R located?



- A (30, 25)  B (10, 40)

C (35, 10)

D (25, 20)

5. Solve the following. Mark your answer.

$$943 - 195 =$$

A 657

B 748

C 576

D 475

6. Benjamin wants to estimate the sum of 170, 374 and 260 to nearest 100's. What is his estimated sum? Mark your answer.

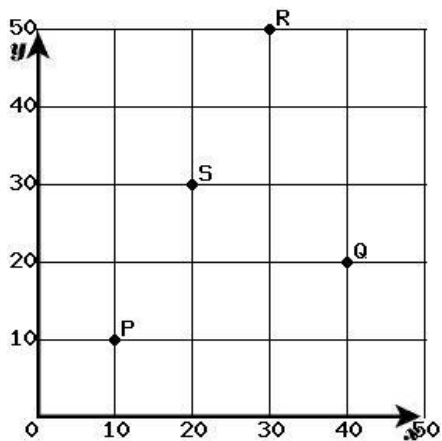
A 1100

B 1000

C 800

D 900

7. Ryan created a graph to show 4 points. Which point is located at (40, 20)?





- A Point S
- B Point R
- C Point Q
- D Point P

8. The numbers on the tiles follow a pattern.

9 13 10 14 11 15

Find the next number in the pattern.

- A 14
- B 11
- C 12
- D 10

9. What number can be filled in the blank to make the number sentence valid?

$$(\underline{\quad} + 16) - 15 = 15$$

- A 16
- B 12
- C 13
- D 14

10. Solve the following. Mark your answer.

$$280 \div 3 =$$

A 280

B 290

C 270

D 260

11. Brandon bought 10 apples and his friend Margaret bought 7 mangos. The price of each apple is \$0.75 and the price of each mango is \$1.25. What is the total price of the fruits Brandon and Margaret bought together? Mark your answer.

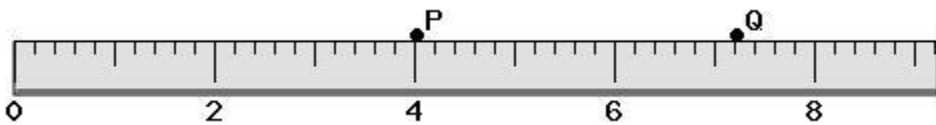
A \$19.00

B \$16.25

C \$12.75

D \$21.25

12. Two points are marked on the ruler as shown in the picture below.



What is the distance between point P and point Q? Mark your answer.

A 3.2

B 2.8

C 3

D 3.4

13. Solve the following. Mark your answer.

$$492 \times 8 =$$

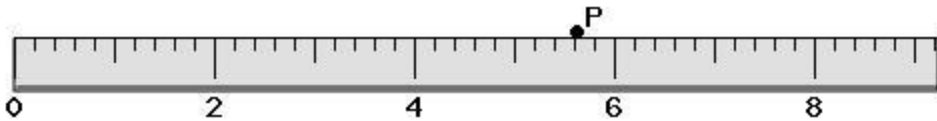
A 3946

B 3836

C 3846

D 3936

14. Joshua marked a point P as shown in the picture.



Where is point P located? Mark your answer.

A 6.2

B 5.6

C 5

D 5.4

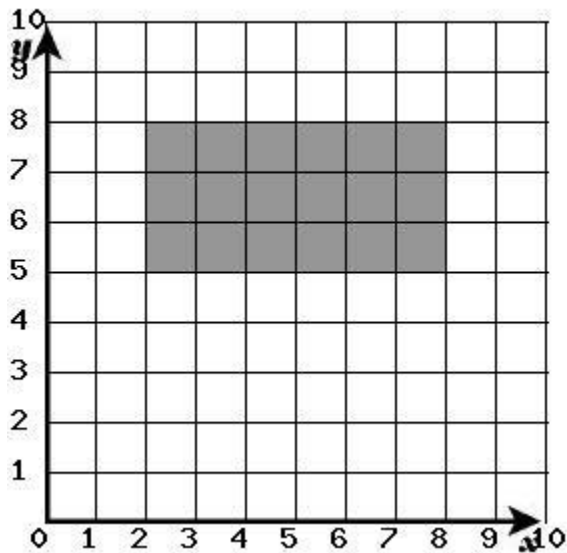
15. If a 1 metre rope is cut into 10 equal pieces, then what is the length of each piece? Mark your answer.

A 10 cm

B 1 cm

- C 1 mm  D 100 cm

16. What is the perimeter of the shaded rectangle (each division in the graph represents 1 mile)? Mark your answer.



- A 17 miles  B 19 miles  
 C 18 miles  D 9 miles

17. Brandon bought 9 apples and his friend Hannah bought 4 mangos. The price of each apple is \$0.75 and the price of each mango is \$1.25. What number sentence can be used to find the total price of the fruits bought by Brandon and Hannah? Mark your answer.

- A  $(9 \times \$0.75) + (4 \times \$1.25)$   B  $(9 + 4) \times \$1.25$   
 C  $(9 \times \$0.75) \times (4 \times \$1.25)$   D  $(9 + 4) \times \$0.75$

18. Nicholas's mother bought 12 bags of carrots and 7 bags of cucumbers. Each bag of carrots has 24 carrots and each bag of cucumbers has 10 cucumbers. What number sentence can be used by Nicholas to find the total number of carrots and cucumbers? Mark your answer.

A  $(12 + 7) \times 24$

B  $(12 + 7) \times 10$

C  $(12 \times 24) + (7 \times 10)$

D  $(12 \times 24) \times (7 \times 10)$

19. Solve the following. Mark your answer.

$$294 \times 4 =$$

A 1176

B 1286

C 1276

D 1186

20. Solve the following. Mark your answer.

$$756 + 239 =$$

A 900

B 895

C 995

D 905

## Complex Math Test

## Math Test 1 / 2

- *You will be given 10 minutes to complete this test.*
- *If you complete the test before the 10 minutes are finished, please put down your pencil and close your booklet.*
- *You may not use a calculator, but you can use the blank paper provided or if you wish, you can solve the questions directly on this paper.*
  
- *You will receive one point for each correct answer.*
- *You will be deducted one point for each skipped or unanswered question.*
- *You will be deducted .20 points for each incorrect answer.*

1. Solve the following. Mark your answer.

$$2652 + 4632 =$$

- A. 7184
- B. 2784
- C. 8724
- D. 7284
- E. 8734

2. What is the greatest common factor of 3 & 12?

- A. 1
- B. 3
- C. 6
- D. 9
- E. 12

3. Of the following, which is greater than  $\frac{1}{2}$ ?

- A.  $\frac{2}{5}$
- B.  $\frac{4}{7}$
- C.  $\frac{4}{9}$
- D.  $\frac{5}{11}$
- E.  $\frac{6}{13}$

4. If an object travels at five feet per second, how many feet does it travel in one hour?

- A. 30
- B. 300



- C. 720
- D. 1800
- E. 18000

5. Solve the following. Mark your answer.

$$\$6699.42 - \$1130.26 =$$

- A. \$5466.16
- B. \$5566.16
- C. \$5569.06
- D. \$5569.16
- E. \$5669.16

6. In a class of 78 students 41 are taking French, 22 are taking German. Of the students taking French or German, 9 are taking both courses. How many students are not enrolled in either course?

- A. 6
- B. 15
- C. 24

D. 33

E. 54

7. Solve the following. Mark your answer.

$$402 \times 739 =$$

A. 296 058

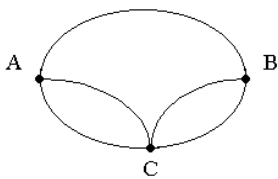
B. 296 068

C. 297 078

D. 297 088

E. 297 098

8.

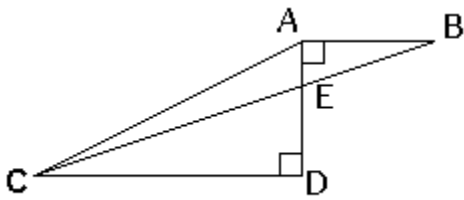


Amy has to visit towns B and C in any order. The roads connecting these towns with her home are shown on the diagram. How many different routes can she take starting from A and returning

to A, going through both B and C (but not more than once through each) and not travelling any road twice on the same trip?

- A. 10
- B. 8
- C. 6
- D. 4
- E. 2

9.



In the figure above  $AD = 4$ ,  $AB = 3$  and  $CD = 9$ . What is the area of triangle AEC ?

- A. 18
- B. 13.5
- C. 9
- D. 4.5
- E. 3

10. Helpers are needed to prepare for the party. Each helper can make either 2 large cakes per hour, or 35 small cakes per hour. The kitchen is available for 3 hours and 20 large cakes and 700 small cakes are needed. How many helpers are required?

- A. 10
- B. 15
- C. 20
- D. 25
- E. 30

11. What is  $\frac{2}{3} + \frac{3}{4}$ ?

- A.  $\frac{5}{12}$
- B.  $1 \frac{5}{12}$
- C.  $2 \frac{1}{12}$
- D.  $2 \frac{5}{12}$
- E. 3

12. Jo's collection contains Canadian, Indian and British stamps. If the ratio of Canadian to Indian stamps is 5 to 2 and the ratio of Indian to British stamps is 5 to 1, what is the ratio of Canadian to British stamps?

- A. 5 : 1
- B. 10 : 5
- C. 15 : 2
- D. 20 : 2
- E. 25 : 2

13. After being dropped a certain ball always bounces back to  $\frac{2}{5}$  of the height of its previous bounce. After the first bounce it reaches a height of 125 inches. How high (in inches) will it reach after its fourth bounce?

- A. 20
- B. 15
- C. 8
- D. 5
- E. 3.2

14. Six years ago Anita was  $P$  times as old as Ben was. If Anita is now 17 years old, how old is Ben now in terms of  $P$  ?

- A.  $11/P + 6$
- B.  $P/11 + 6$
- C.  $17 - P/6$
- D.  $17/P$
- E.  $11.5P$

15.  $7/8 = \underline{\hspace{1cm}} \%$  ?

- A. 0.551
- B. 0.556
- C. 0.666
- D. 0.875
- E. 0.975

16. If  $pqr = 1$ ,  $rst = 0$ , and  $spr = 0$ , which of the following must be zero?

- A. P
- B. Q
- C. R
- D. S
- E. T

17. Solve the following. Mark your answer.

$$525 \div 25 =$$

- A. 21
- B. 22
- C. 23

D. 24

E. 25

18. A cubical block of metal weighs 6 pounds. How much will another cube of the same metal weigh if its sides are twice as long?

A. 48

B. 32

C. 24

D. 18

E. 12

19. Solve the following. Mark your answer.

$$971 - 481 =$$



- A. 450
- B. 490
- C. 540
- D. 590
- E. 640

20. If  $n \neq 0$ , which of the following must be greater than  $n$ ?

I  $2n$

II  $n^2$

III  $2 - n$

- A. I only
- B. II only
- C. I and II only
- D. II and III only
- E. None

## Appendix D



## INFORMED CONSENT FORM

**STUDY TITLE:** Effects of Attitudes on Task Performance

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**SUPERVISING** Angela Birt, Ph. D.

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## INTRODUCTION

My name is Ann Marie Beals and I am an undergraduate student at Mount Saint Vincent University. Please read this informed consent carefully and consider the following information prior to giving consent to participate in this study. This letter will describe the purpose, procedures, possible risks and benefits of this study.

If you have any questions or concerns, please discuss them with the principal investigator or the supervising professors, at any point of time, before, during, or after the study.

## BACKGROUND

Understanding that certain attitudes are necessary for task performance, we will examine differences in the mental processes of task performance and explore why these differences exist.

## PURPOSE

*The purpose of this study is to investigate the nature of attitudes and the mental processes of task performance.*

## PROCEDURE

If you choose to participate, the session should take no longer than 30 minutes to complete. You will be asked to complete a number of tasks, including math problems, within a 20-minute time-frame.

## PARTICIPATION

Your participation is voluntary and you may withdraw from this study at any time, before, during or after, without penalty. Non-participation in this study will not affect your grades, nor your instructor's evaluation of your performance.

## RISKS

There are no significant risks associated with this study; however, it is possible you may experience some unpleasant feelings or discomfort as a result of participating in this study. If you feel unwell or have any discomfort during the study, alert the researcher and your participation can be immediately discontinued. There will be no negative repercussions for deciding not to participate and to leave the room. Counselling services are also available. If you feel the need to avail yourself of such services, please contact the supervising professors or the counselling services at MSVU Health Office, 2<sup>nd</sup> floor of Assissi Hall - 902-457-6354.

### BENEFITS

It will be a benefit to participate by assisting your fellow Psychology students, so that we are able to collect the most accurate data possible. The experience of participating in research studies allows you to further examine the theoretical research process. Another important reason to consider is the benefit of understanding what factors affect problem solving processes. Research participation credit may be offered at the discretion of your professor.

### HOW WILL THE DATA BE USED?

The data will be used to create a data set, which will be analyzed, and subsequently, a research paper generated. All data will have the demographic information of age, gender and race, and will be anonymous and only group data will be presented.

### CONFIDENTIALITY

All data collected will be anonymous, and only group data will be presented. Once the study is completed and all presentations of the research are concluded, the data and the informed consent

letter will be shredded, no later than May 30<sup>th</sup>, 2015. The electronic data, which will be stored in a password-protected file on a secure server housed at Mount Saint Vincent University and any back-up data, will be erased by May 30<sup>th</sup>, 2015. The data from this study will not be used in any future studies. At any time, you are able to withdraw from this study; however, if you withdraw from the study after the data are collected, we will not be able to retrieve your data, as there is no identifying information, as the participation ID number is arbitrary and anonymous.

#### INFORMATION

If you have any or specific questions about this study, please contact the principal investigator, Ann Marie Beals – E: [Ann.Marie.Beals@msvu.ca](mailto:Ann.Marie.Beals@msvu.ca).

If you have any questions about how this study is being conducted and wish to speak to someone not directly involved in the study, you may contact the Chair of the University Research Ethics Board (UREB) c/o MSVU Research Office, at 902-457-6350 or via e-mail at [research@msvu.ca](mailto:research@msvu.ca).

The ethical components of this research study have been reviewed by the Psychology Department Research Ethics Board and found to be in compliance with Mount Saint Vincent University's Research Ethics Policy.

## Appendix E

## Instructions for Nonprimed Group

There are two math tests in your booklets and you will be timed for each test.

You are not to use a calculator for these tests, but you can use the blank paper in your booklet or the blank paper provided to you as scrap paper.

For the first test, you will have 10 minutes to complete. When the time is up or if you finish before the time is up, I will ask you to put down your pencils and close your booklets.

For the second test, you will have 10 minutes to complete. When the time is up or if you finish before the time is up, I will ask you to put down your pencils and close your booklets.

Scoring is as follows:

You will receive one point for each correct answer.

You will be deducted one point for each skipped or unanswered question.

For the multiple-choice questions, you will be deducted either .20 or .25 points for each incorrect answer, depending on how many possible answers there are. In other words, if you have a question that has five possible answers and you answer it incorrectly, you will be deducted .20 of a point. If you have a question that has four possible answers, you will be deducted .25 of a point.

You are requested to stay for the full 20 minutes of testing time, regardless of whether you have completed all questions or not; however, if you finish one test early, you cannot go back and finish the test you may have not completed. Once a test is done, it is done.

You can withdraw for the study at any time, without penalty or repercussion.

Any questions?

*Set the timer.*

Please open your booklets to page three and start the first test.

*Time is up.*

Please put down your pencils and close your booklets.

*Set the timer.*

Please open your booklets to page five and start the second test.

*Time is up.*

Thank you everyone. One last thing, please complete the demographic information at the back of the booklet.

If your professor is offering course credit, please put your student ID number and professor's name on this sheet.

When you are done, I will collect the booklet and you are ready to go.

Thank you very much for your time.

## Instructions for Primed Group

We have an audiotape for you to listen to explaining some of the reasons why we have math performance differences.

*Start audiotape.*

*Audiotape: Please open your booklets to the third page. This page explains the reasons why we are doing this study.*

*Wait four seconds...*

*We are interested in understanding how students perform on math tests and particularly, what causes some students to perform better in math than other students. As you know, math skills are important for doing well in many subject areas in university and are important in the career choices we make. Unfortunately however, there are systematic differences in math performance among students because of their race and there are math performance differences between males and females. Surprisingly, little is known about the mental processes underlying math performance that explain why there are differences in the groups of race and gender. This research is aimed at better understanding why race and gender-based groups underperform on math tests.*

*Please go to page four in your booklet and complete the demographic information, then close your booklet.*

*Stop audiotape.*

There are two math tests in your booklets and you will be timed for each test.

You are not to use a calculator for these tests, but you can use the blank paper in your booklet or the paper provide to you as scrap paper.



For the first test, you will have 10 minutes to complete. When the time is up, I will ask you to put down your pencils and close your booklets.

For the second test, you will have 10 minutes to complete. When the time is up, I will ask you to put down your pencils and close your booklets.

Scoring is as follows:

You will receive one point for each correct answer.

You will be deducted one point for each skipped or unanswered question.

For the multiple-choice questions, you will be deducted either .20 or .25 points for each incorrect answer, depending on how many possible answers there are. In other words, if you have a question that has five possible answers and you answer it incorrectly, you will be deducted .20 of a point. If you have a question that has four possible answers, you will be deducted .25 of a point.

You are requested to stay for the full 20 minutes of testing time, regardless of whether you have completed all questions or not; however, if you finish one test early, you cannot go back and finish the test you may have not completed. Once a test is done, it is done.

You can withdraw from the study at any time without penalty or repercussion.

If you feel unwell at any time during this process, please alert me.

Any questions?

*Set the timer.*

Please open your booklets to page five and start the first test.

*Time is up.*

Please put down your pencils and close your booklets.

*Set the timer.*

Please open your booklets to page ten and start the second test.

*Time is up.*

Thank you everyone. You are now done.

*Debrief.*

If your professor is offering course credit, please put your student ID number and professor's name on this sheet.

When I collect the booklet, you are ready to go.

Thank you very much for your time.

## Appendix F

## Effects of Attitudes on Task Performance

## Debriefing Information

Researcher: Ann Marie Beals

Ann.Marie.Beals@msvu.ca or 902-893-2158

Supervisor: Angela Birt

Angela.Birt@msvu.ca or 902-457-6667

Supervisor: Donna Thompson

Donna.Thompson@msvu.ca or 902-457-6667

Thank you for taking part in this study. The following will provide you with full details of the study in which you participated.

The purpose of the study was to investigate the effects of stereotype threat and task performance.

As you heard at the beginning of the study, females and those of the non-dominant race sometimes underperform on difficult tasks, like a math test. This research was designed to see if the introduction of a simple task prior to a complex task reduced stereotype threat.

You were assigned to the experimental group, whereas you were exposed to a stereotype threat, and the audio recording played at the beginning of the study was that threat. Some of you completed an easy math test first and then completed a complex math test, and some of you completed the complex test first and then the easy one.

These tests were designed to be easy and to be hard, so hard that it was unlikely that any of you would complete the entire test in the 10 minutes allotted. The outcomes of how well you performed on the hard test compared to those who have not heard the stereotype threat and

completed the hard test will assess if there is a benefit to completing an easy task before a hard task. And that is the premise of this study.

Throughout the upcoming weeks we will be having other students participating in this study. For this reason, we ask that you **DO NOT DISCUSS** this study with anyone else until the last day of classes of this semester (April 10, 2015).

Thank you again for taking part in this study. If there is anything you would like to discuss in relation to this study or simply share your experience, please feel free to do so by asking the researcher or by contacting the supervisors. If you have questions about how this study is being conducted and wish to speak with someone who is not directly involved in the study, you may contact the Chair of the University Research Ethics Board (UREB) c/o MSVU Research and International Office, at email: [research@msvu.ca](mailto:research@msvu.ca) or call 457-6350

Before you leave:

- 1)** The researcher will give you a contact information sheet with all the contact information above (and additional contact) to take with you for future reference.
- 2)** If your professor is offering research participation points or course credit in exchange for your participation in this study, your professor will receive an email at the end of the current semester to confirm your participation in this study. Remember, your professor is in no way obligated to do so.
- 3)** The results of this experiment will be presented at the Psychology Department's Annual Research Day in April 2015. You are most welcomed to attend this event.

Thank you!

Do you have any questions?

## Appendix G

Table 1

*Standardized Means and Standard Deviations of Participant Total Test Scores on Simple and Complex Math Tests According to Test Type*

		<i>M</i>	<i>SD</i>
Simple	Simple / Complex	-.23	.97
	Complex / Simple	.18	1.01
Complex	Simple / Complex	.37	1.19
	Complex / Simple	-.29	.71

*Table 1. Means and Standard Deviations Table*

## Appendix H

Table 2

*Threat Condition x Test Order Analysis of Variance of Standardized Mean Total Test Scores*

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	$\eta_p^2$
Test Type	.06	1	.06	.10	.76	.00
Test Order	.29	1	.29	.23	.63	.01
Interaction (Test Type x Test Order)	5.09	1	5.09	7.90	.01	.19
Error	21.91	34	.64			
Total	27.35	37				

*Table 2. ANOVA Source*

## Appendix I

Table 3

*Standardized Means and Standard Deviations of Participant Total Test Scores on Simple and Complex Math Tests According to Threat Condition*

		<i>M</i>	<i>SD</i>
Simple	Prime	.27	.81
	Nonprime	-.33	1.14
Complex	Prime	-.08	.88
	Nonprime	.10	1.16

*Table 3. Means and Standard Deviations Table*

## Appendix J

Table 4

*Threat Condition x Test Type Analysis of Variance of Standardized Mean Total Test Scores*

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	$\eta_p^2$
Threat Condition	.75	1	.75	.60	.44	.02
Test Type	.03	1	.03	.05	.83	.00
Interaction (Threat Condition x Test Type)	2.73	1	2.73	3.83	.06	.10
Error	24.26	34	.71			
Total	27.77	37				

*Table 4. ANOVA Source*



## Appendix K

Table 5

*Standardized Means and Standard Deviations of Prime-Only Participant Total Test Scores on Simple and Complex Math Tests According to Test Order x Test Type*

		<i>M</i>	<i>SD</i>
Simple	Simple / Complex	.11	.34
	Complex / Simple	.33	.22
Complex	Simple / Complex	.23	.36
	Complex / Simple	-.22	.23

*Table 5. Means and Standard Deviations Table*

## Appendix L

Table 6

*Prime-Only Test Type x Test Order Analysis of Variance of Standardized Mean Total Test Scores*

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	$\eta_p^2$
Test Type	.39	1	.39	.79	.39	.04
Test Order	.10	1	.10	.11	.75	.01
Interaction (Test Type x Test Order)	.94	1	.94	1.90	.19	.10
Error	8.89	18	.49			
Total	10.32	21				

*Table 6 ANOVA Source*

## Appendix M

Table 7

*Standardized Means and Standard Deviations of Participant Total Test Scores on Simple and Complex Math Tests According to Threat Condition, Test Type, and Test Order*

		<i>M</i>	<i>SD</i>
Prime	Simple / Complex	.11	.40
Simple / Complex	Complex / Simple	.23	.40
Prime	Simple / Complex	.33	.27
Complex / Simple	Complex / Simple	-.22	.26
Nonprime	Simple / Complex	-.43	.31
Simple / Complex	Complex / Simple	.45	.31
Nonprime	Simple / Complex	-.17	.40
Complex / Simple	Complex / Simple	-.48	.40

*Table 7. Means and Standard Deviations Table*

## Appendix N

Table 8

*Threat Condition x Test Type x Test Order Analysis of Variance of Standardized Mean Total Test Scores*

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	$\eta_p^2$
Threat Condition	1.15	1	1.15	.89	.35	.03
Test Type	.02	1	.02	.03	.86	.00
Test Order	.03	1	.03	.02	.88	.00
Interaction (Threat Condition x Test Type)	1.00	1	1.00	1.55	.22	.05
Interaction (Threat Condition x Test Order)	.21	1	.21	.16	.69	.01
Interaction (Test Type x Test Order)	3.40	1	3.40	5.25	.03	.14
Interaction (Threat Condition x Test Type x Test Order)	.26	1	.26	.41	.53	.01
Error	20.69	32	.65			
Total	26.76	39				

*Table 8. ANOVA Source*