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Coping with stereotype threat: Multiple identities and the role of gender-professional identity integration (G-PII)

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ABSTRACT

Negative stereotypes concerning females' inferior quantitative abilities continue to hinder females' preference and success in science, technology, engineering, and mathematics (STEM) fields. Studies on multiple identities show that priming females with a favorable identity, a social identity they possess that is associated with superior quantitative abilities, can reduce the aversive effects of stereotype threat. However, this line of research overlooked the fact that females manage their multiple identities in different ways and therefore respond to identity cues differently. This paper examined the role of gender-professional identity integration (G-PII), an individual difference on perceived compatibility of gender and professional identities, in influencing how women cope with stereotype threat when a favorable identity is primed. Study 1 examined how female professionals with varying levels of G-PII react to identity cues differently. Results show that only Low G-PIIs were sensitive to the identity cues and behaved in accordance to the primed identity. In contrast, High G-PIIs were not significantly influenced by the identity cues. Moreover, performance differences were only observed in a domain where females are stereotyped against (i.e., in a math test). Study 2 investigated how G-PII influences the effects of stereotype threat when a favorable identity is made salient during stereotype threat and the underlying mechanism that accounts for the performance difference observed amongst females with different levels of identity integration. The findings of Study 2 were not significant but were consistent with the prediction that Low G-PIIs spend more cognitive effort in processing identity cues, depleting those that could have been use for subsequent performance task. The theoretical implications, practical implications, and future directions of this paper will then be discussed.

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Chapter 1. INTRODUCTION

Females are less likely than males to enter and remain in science, technology, engineering, and mathematics (STEM) fields (Hill, Corbett, & St Rose, 2010) even though some evidence show that males and females are matched for quantitative ability and experience (Strenta, Elliott, Adair, Matier, & Scott, 1994). The fact is females earned only 18% of the bachelor's degrees in computer science, 43% of the bachelor's degrees in math, 20% of the degrees in engineering, and 40% of the degrees in physical science (National Science Foundation, 2014). The gender imbalance in STEM fields results not only in missed opportunities for females, but also society may be deprived of the benefits that diverse perspectives can offer (Hong & Page, 2004; Margolis & Fisher, 2002; Plaut et al., 2015).

Females are commonly perceived as possessing inferior quantitative abilities compared to their male counterparts, and these negative stereotypes about females' quantitative abilities brings about underperformance among female in STEM fields (e.g., Inzlicht & Ben-Zeev, 2000; Murphy, Steele, & Gross, 2007; Sekaquaptewa & Thompson, 2003). These negative stereotypes also account for females' reduced interested in these fields (Oswald, 2008) and diminished well-being (von Hippel, Sekaquaptewa, & McFarlane, 2015) of females working in such environments.

Although the gender stereotype continues to hinder females' abilities to succeed in STEM fields, a line of research demonstrating the use of multiple identities in coping with the aversive effects of stereotype threat provides an optimistic outlook for females involved in these fields. Studies show that shifting the focus from females' gender identity to their professional identity (i.e., the identity associated to the field they are working in) led to optimal performance in math tests rather than performance decrements that would have been observed if their focus remained on their gender (Shih, Pittinsky, & Ambady 1999; McGlone & Aronson, 2006; Rydell, McConnell, & Beilock, 2009).

Yet, research on multiple social identities management demonstrates that females react differently to identity cues (Sacharin, Lee, & Gonzalez, 2009; Mok & Morris, 2012b), suggesting the importance of considering individual differences in response to identity cues. Females within STEM fields typically possess two identities: their gender identity, and their professional identity, and they differ in the way they manage these two identities. The term, gender-professional identity integration (G-PII) refers to the degree of perceived compatibility between gender and professional identities (Sacharin et al., 2009). Females with higher identity integration perceive their two identities as compatible and complementary. In contrast, individuals with lower identity integration perceive an incompatibility between their two identities such that they feel caught between the two identities and prefer to keep them separate. Females with higher levels of identity integration generally exhibit the assimilation effect whereby they display prime-consistent behaviors (e.g, poorer math performance when their gender identity is primed). Conversely, females with lower levels of identity integration generally exhibit the contrast, displaying behaviors inconsistent with the primed identity (e.g., better math performance when primed with their gender.

Till date, research on multiple identities and stereotype threat has paid more attention to identity cues than the individual differences in reactance to identity cues. Specifically, previous research has only manipulated situational identity cues to observe how the salience of a favorable identify (i.e., an identity associated with a positive stereotype) help to reduce the aversive effect of stereotype threat (Shih et al., 1999; McGlone & Aronson, 2006; Rydell et al., 2009), concluding that this strategy can be beneficial for females in times of stereotype threat. However, given that females react differently to different cues, depending on how they perceive their gender and professional identity, it is necessary to consider this individual difference among females to further understand to use of multiple identities to cope with

stereotype threat. It is likely that the benefit concluded from previous studies may not be applicable to all females.

In two studies, this research aims to examine the role of gender-professional identity integration (G-PII) in influencing how females cope with stereotype threat when a favorable identity is primed. Overall, I predict that females with varying levels of G-PII react to different identity cues differently. Moreover the difference in performance between females with higher levels of G-PII and females with lower levels of G-PII will only be observed in tasks females are negatively stereotyped against (i.e., math and visual-spatial task). Additionally, I expect females with higher levels of G-PII to benefit from the salience of a favorable identity during stereotype threat while females with lower levels of G-PII suffer from the salience of a favorable identity during stereotype threat. This difference is accounted by the cognitive resources spent by females with lower levels of G-PII in switching over to identify with the favorable identity during stereotype threat.

Chapter 2. STEREOTYPE THREAT

The theory of stereotype threat posits that individuals belonging to stigmatized groups underperform on diagnostic tests of ability through concerns about confirming to a negative societal stereotype (Steele & Aronson, 1995). In situations where a negative stereotype applies, individuals become anxious that anything they do may be perceived as fitting to the stereotype, and hence judged and treated stereotypically (Spencer, Steele, & Quinn, 1999). As a consequence, the additional stress of possibly being evaluated by or self-fulfilling the stereotype interferes with performance by redirecting the attention needed to perform on a task, causing the individual to perform at a level that conforms to the stereotype (Steele & Aronson, 1995).

The effects of stereotype threat can be observed from the differences in intellectual test scores between stigmatized and non-stigmatized groups, such as between African and European Americans (Steele & Aronson, 1995), and females and males (Spencer, Steele, & Quinn, 1999). Steele and Aronson (1995) demonstrated that African American participants underperformed on a verbal reasoning test when it was presented as a diagnostic indicator of intellectual ability. When the same test was presented as non-diagnostic of ability, they performed equivalently to their Caucasian peers (Steele & Aronson, 1995). The evaluation pressures created by the possibility of conforming to the negative stereotype that African Americans lack intellectual ability led to the performance decrements. This seminal research demonstrates how the mere salience of negative societal stereotypes can impede performance of socially stigmatized groups. Stereotype threat effects has also been documented across a number of other groups and the domains in which these groups are negatively stereotyped, such as poor academic performance among Latinos (Schmader & Johns, 2003), poorer performance on working memory tasks among older adults (Levy, 1996), and poorer performance on rational thinking tests among students with mental illness (Quinn et al., 2004) when their membership is primed.

The Effects of Stereotype Threat on Females

The diversity of evidence on gender stereotypes contributes to a good deal of confidence that the performance of females is undermined by stereotype threat, especially in domains where males are thought of to possess superior ability in. General stereotypes about females typically revolve about their inferior quantitative abilities compared to males, and a large number of studies have demonstrated the performance gap between males and females in the area of mathematics (e.g., Spencer et al., 1999; Gresky, Ten Eyck, Lord, & McIntyre, 2005; Danaher and Crandall, 2008; Inzlicht & Ben-Zeev, 2000; Quinn & Spencer, 2001; Schmader, Johns, & Barquissau, 2004).

Decrements in math performance have been observed when females are reminded of their gender (Spencer et al., 1999). In Spencer et al.'s (1999) experiment, males and females were randomly assigned in two conditions where they were either told that the math test they were about to work on had shown gender differences in the past or that it had not shown gender differences in the past. Participants assigned to the condition where they were told that the test showed no gender differences, similar performance was observed between males and females. However, females performed significantly worse on the test compared to males when they were told that the test had shown gender differences. Danaher and Crandall (2008) observed a similar trend amongst female students' Calculus exam in which high school students were either asked to report their gender before they began the test or after they completed the test. Female students who indicated their gender before the test underperformed by 33% as compared to female students who reported their gender after the test, translating to an additional 5.9% of female test takers who would have achieved a passing exam score, which would have earned them a college calculus credit.

The detrimental effects of stereotype threat on females' math performance are not only observed amongst young adults, but can also be observed amongst younger girls (e.g., Huguet & Regner, 2007; 2009). Keller and Dauenheimer (2003) adopted Spencer et al.'s (1999) study and performed it with children (15 years old) in a German secondary school. When they were told the test had shown no gender differences in the past, the performance of girls did not differ significantly from the boys. However, girls performed significantly worse than boys when they were told that the test had shown gender differences in the past (please see Good, Aronson, & Harder, 2008, for a similar study). Such effects are observed even they are not explicitly told about gender differences, and just by making their gender salient. Neuville and Croizet (2007) randomly assigned French third graders to colour a picture of a girl with a doll or a boy with a ball (high stereotype condition), or

to colour a picture of a landscape (low stereotype condition). Subsequently, a math test was administered to them. On the difficult math problems, girls and boys performed similarly when gender was not made salient by the colouring task (landscape) but girls performed worse when gender was made salient in the gendered colouring task. A more recent study demonstrated that girls' STEM test preparation was impaired by stereotype threat (Appel, Kronberger, & Aronson, 2011), suggesting that the learning process can also be affected by stereotype threat.

Stereotype Threat and Females in the Workplace

The effects of stereotypes alleging a sex-based inability can also observed in the performances of females in the workplace, especially females in traditionally male-dominated industries and roles. The attributes associated with being a successful manager or a successful executive are perceived, by both males and females, to be more commonly held by males than females (Heilman, Block, Martell, & Simon, 1989; Powell, Butterfield, & Parent, 2002; Schein, 1973; Boyce & Herd, 2003; Martell, Parker, Emrich, & Crawford, 1998). This stereotypical view gives rise to a perceived lack of fit of females in these roles (Heilman, 1983;1995), which translates to the lowered perceived competence of females even when they objectively perform at the same level as their male counterparts (Foschi, 1996). Bergeron, Block, and Echtenkamp (2006) examined the effect of stereotype threat on females' performance on a managerial in-basket task, which tapped upon one's managerial decision-making ability, and found that the performance of females was compromised under stereotype threat. In their study, participants were instructed to assume the role of a senior manager in Human Resources due to the sudden resignation of their predecessor. Stereotype threat was introduced via the manipulation of the predecessor's gender. The results showed that females who were exposed to the stereotype threat (the male predecessor condition) performed worse than females who were assigned to the female predecessor condition, and

worse than their male counterparts assigned to the same male predecessor condition. The performance of males and females were similar in the female predecessor condition.

In addition to hindering performance, the effects of stereotype threat on other workplace outcomes have also been documented, particularly regarding career choices and aspirations. Females who were subtly reminded of their gender report less interest in math fields compared to arts-oriented fields (Steele & Ambady, 2006). In another study, Davis, Spencer, Quinn, and Gerhardstein (2002) showed female participants either a television commercial that depicted females stereotypically (e.g., a woman salivating over the opportunity to try a New brownie mix) or one that depicted females counter-stereotypically (e.g. a woman speaking intellectually about health care concerns). They found that participants who were shown the stereotypic commercials were less likely to report interest in quantitative majors and career paths (e.g. engineers, mathematician, computer science, statistics, accountant, physics) compared to verbal majors and career oaths (e.g., author of novels, linguistics, journalist, communications, political science, editor). Oswald (2008) also found that females reported greater liking for female-dominated occupations when stereotypes were activated than they were not. Von Hippel et al. (2015) also found that females in the finance industry, a field stereotypically associated with males, who experienced chronic feelings of stereotype threat were more likely to report lowered well-being at work, and were less likely to recommend banking and finance as a field to young women. Females who reported more experiences of stereotype threat were less confident of achieving their career aspirations, less satisfied with their jobs, and had more intentions to quit (von Hippel, Issa, Ma, & Stokes, 2011). The effects of stereotype threat on the performance of females have been replicated in the laboratory and in the field in United States (e.g., Stangor, Carr, & Kiang, 1998; McIntyre, Paulson, & Lord, 2003) and other countries that have similar gender stereotypes (e.g., Cadinu, Maass, Rosabianca, & Kiesner,

2005; Muzzatti & Agnoli, 2007), evidencing that stereotype threat is a societal issue that requires attention as it impedes on the performance, career choices, and well-being of females.

How to counter stereotype threat?

Research done on the effects stereotype threat on females, as highlighted in the previous section, has focused exclusively on one social identity of females, that is their gender identity, and this identity is associated with a negative stereotype (i.e., females are bad at math). Such approach has overlooked the fact that an individual possess more than one social identity. In fact, individuals possess multiple identities at any given time. Within an individual, some identities they possess that are associated with negative stereotypes, but there are also some other identities they possess that are associated with positive stereotypes (Shih et al., 1999). Based on this, research has found that making a favorable identity salient, that is an identity one possesses that is associated with a positive stereotype, buffered the effects of stereotype threat (Shih et al., 1999; McGlone & Aronson, 2006; Rydell et al., 2009). These studies suggest that activating the favorable identity amongst the multiple identities females possess can aid them in coping with the effects of stereotype threat. But before detailing how the possession of multiple identities work to help females cope with the effects of stereotype threat, I first review the multiple social identities females possess and the potential impact of these identities on their behaviors.

Chapter 3. SOCIAL IDENTITIES

According to the social identity theory, people classify themselves into various social categories, such as gender, age cohort, organizational and work membership (Tajfel & Turner, 1979). By identifying with a social group, it implies that an individual endorses the group' s values and practices, conform to its norms, attribute the characteristics typical for

the group to oneself, and display behaviours that are congruent with the identity (Ashforth & Mael, 1989). In other words, identities guide how people perceive the world and the organization of their behaviour (Tajfel & Turner, 1979).

Individuals usually belong to multiple social groups and possess more than one social identity (Turner & Oakes, 1986). For females in STEM fields, on top of their gender identity, females hold a social identity associated with their work by virtue of being in an organization or a workplace (Ashforth & Mael, 1989). In this sense, these females, hereinafter referred to as female professionals, typically possess both a female identity, derived from their gender, and a professional identity, derived from their roles in the workplace. By identifying with both their gender and professional identities, these females incorporate the meaning and expectations associated with these two identities into the self, which guides their behaviour within their work environment (Stets & Burke, 2000).

Multiple Social Identities and Stereotype Threat

Given that female professionals possess a gender identity, associated with a negative stereotype that they are bad at math, and a professional identity, associated with a positive identity that they have superior quantitative abilities, Shih et al. (1999) argued that females do not have to suffer from the aversive effects of stereotype threat if the focus was shifted to their other identity associated with a positive stereotype. For instance, Asians are stereotyped to have superior quantitative skills compared to other ethnic groups (Steen, 1987). Hence, using a group of Asian-American females, Shih et al. (1999) demonstrated that females who were reminded of their Asian identity performed better than those who were reminded of their gender identity.

Similar findings were replicated in a more recent study. McGlone and Aronson (2006) primed students with different social identities, they found that females who were primed to contemplate their identity as students at a selective private college performed better

than those who were primed to contemplate their sex or a test-irrelevant identity. Rydell et al., (2009) randomly assigned female college students into one of four conditions: (a) gender identity was made salient, (b) college identity was made salient, (c) both gender and college identity made salient, or (d) when neither gender nor college identity was made salient. Math performance of female college students assigned to the gender-identity-salient condition was significantly lower compared to the other three conditions, which did not differ among themselves. Collectively, these studies highlight the potential of increasing the salience a favourable identity (i.e., the identity associated with a positive stereotype) in an effort to buffer against the evaluation apprehension triggered by negative stereotype about their gender identity.

But is that all to it? Insofar, the studies highlighted in the previous sections demonstrate that females generally assimilate to identity cues; that is when primed with an identity, females behave in identity-consistent ways (e.g., bad math performance when their gender is primed and good math performance when a favorable identity is primed). However, studies examining females engaged in masculine sex-typed organizational tasks show that females can also react against identity cues and behave in count-stereotypic ways. Kray, Thompson, and Galinsky (2001) showed that females, when primed explicitly about their gender, outperformed males in a bargaining task. Hoyt & Blascovich (2007) also found that females performed better at a leadership task when primed with a gender leader stereotype than when not.

Reactance against identity cues can also be observed from research on identity integration where individuals differ in the ways they manage their multiple social identities. Individuals who tend to perceive conflict between their social identities are more likely to show reactance against identity cues than to assimilate to them (e.g., Benet-Martinez, Leu, Lee, & Morris, 2002; Cheng, Lee, & Benet-Martinez, 2006; Sacharin et al., 2009). Hence, to

fully understand the use of a favourable identity to cope with stereotype threat, it is necessary to bear in mind that females differ in their reaction to identity cues. The different reactions females produce in response to identity cues can be better understood from research on the management of multiple social identities.

Chapter 4. IDENTITY INTEGRATION

Research on the management of multiple social identities largely examines how individuals with multiple social identities manage their identities, and as a consequence, how they behave in response to identity cues. Identity integration research is first applied to immigrants and ethnic minorities who possess two cultural or ethnic identities: one is related to their culture of origin or ethnic culture, and the other is related to the mainstream or dominant culture. These individuals usually face the issues of retaining their identification with their culture of origin, and identifying with the dominant culture. According to Berry's (1990) acculturation framework, biculturals are considered to have adopted the integration strategy, whereby they identify with both cultures and develop a bicultural identity (LaFromboise, Coleman, & Gerton, 1993; Phinney & Devich-Navarro, 1997).

Even though they identify with both cultures, biculturals differ in the way they managed their multiple cultural identities (e.g., Benet-Martinez et al., 2002; Haritatos & Benet-Martinez, 2002; Hong, Morris, Chiu, & Benet-Martinez, 2000). Specifically, Benet-Martınez and Haritatos (2005) proposed the construct identity integration (II) to capture the degree to which two social identities are perceived as compatible or in opposition to each other. Biculturals who integrate their dual cultural identities well generally perceived their identities as compatible and are considered high identity integrators. These biculturals show behavioural competency in both cultures and switch between their behaviors according to the cultural demands of their social environment (Birman, 1994). On the other hand, some

biculturals who face issues integrating their dual cultutral identities generally perceive their identities to oppose each other and are considered low identity integrators. These biculturals are highly aware of the discrepancies between their cultures and see the differences as an internal source of conflict. Consequently, they keep their cultural identities separate and feel as if they have to choose one identity over the other (Phinney & Devich-Navarro, 1997; Vivero & Jenkins, 1999).

The construct of II encompasses two independent constructs: (a) cultural blendedness versus distance; and (b) cultural harmony versus conflict (Haritatos & Benet-Martınez, 2002). Cultural blendedness versus distance refers to the degree of overlap versus dissociation perceived between the two identities (e.g., "I am an Asian-American" vs. "I see myself as an Asian in the United States"). Cultural harmony versus conflict refers to the degree of compatibility versus tension perceived between the two identities (e.g., "I do not sense conflict between the Asian and American ways of doing this" vs. "I feel trapped between the two cultures"). Cultural distance is predicted by personality (e.g., low on openness), bicultural competence (e.g., not being comfortable with both cultures, tends to be more involved in one culture), linguistic stress (e.g., greater language barriers), and living in more culturally isolated surroundings, whereas cultural conflict stems from the personality trait of neuroticism (e.g., higher neuroticism), linguistic stress, strained intercultural relations, and greater perceived discrimination (Benet-Martínez & Haritatos, 2005). The overall level of identity integration is determined by both the level of distance perceived and the level of conflict experienced by biculturals.

Identity Frame Switching

Biculturals shift back and forth between their two cultural identity frames of reference as they respond to cues and navigate through their social environment. This process, termed as frame switching, helps biculturals guide their thoughts and behaviours (Hong et al., 2000).

To illustrate, when primed with American icons, Chinese-Americans biculturals exhibit typical Western cultural behaviours (i.e., making more internal attributions), but when exposed to Chinese icons, they exhibit typical Eastern Asian cultural behaviors (i.e., making more external attributions). The evidence of frame switching has been documented in various studies (please see Hong, Wan, & Chiu, 2007 for a review).

Individuals with varying levels of identity integration react differently to the activated identity, such that they either exhibit an assimilation or contrast effect (Benet-Martinez et al., 2002; Cheng et al., 2006; Mok and Morris, 2009; 2010; 2011; 2012a; 2012b). Individuals with higher levels of identity integration will behave in a way that is consistent with the activated identity when network structures linked to that identity is triggered, hence displaying an assimilative effect (i.e., prime-consistent behaviors). Conversely, individuals with lower levels of identity integration will behave in way that is in opposition to the activated identity, hence displaying a contrast effect (i.e., prime-inconsistent behaviors). For instance, when primed with American primes, Chinese-American biculturals with higher levels of identity integration made more internal attributions, a characteristically Western attribution style, than when they were primed with Chinese primes. A reverse pattern was observed with Chinese-American biculturals with lower levels of identity integration who made more external attributions, a characteristically Eastern attribution style, when primed with American primes than with Chinese primes (Benet-Martinez et al., 2002). Similar pattern of findings were observed in other samples, including female lawyers (Mok & Morris, 2012b), female businesspersons (Sacharin et al., 2009), and religious homosexuals (Dahl & Galliher, 2009), where there is individual differences in how people manage their seemingly conflicting dual social identities.

Understanding the Assimilation and Contrast Effect. Recent studies have managed to shed light on the underlying mechanism behind the assimilation and contrast effect. Cheng et al. (2006) found that biculturals with higher levels of BII (High BIIs) and biculturals with lower levels of BII (Low BIIs) assimilate and contrast to different types of cultural cues respectively. When cultural cues were positively valenced, High BIIs assimilated to the cultural cues and Low BIIs contrasted to the cultural cues. However, when the cultural cues were negatively valenced, the opposite occurred; High BIIs contrasted to the cultural cues and Low BIIs assimilated to the cultural cues. This is because positive experiences are more congruent with high BIIs' personal experience whereas negative experiences are more congruent with low BIIs personal experiences. As a result, both high and low BIIs assimilate to contextual cues that are congruent to their experiences and overprocess those that are incongruent to their experiences, which lead to a contrast effect. In short, Cheng et al.'s (2006) findings suggest that biculturals overprocess cues that are inconsistent with their subjective cultural experiences in an attempt reaffirm their own experiences and beliefs about culturalism.

Taking a different stand, Mok and Morris (2013) argued that the contrast effect observed in Low BIIs is due to their motive of protecting the unprimed identity rather than the motive of affirming their subjective experiences. In their study, Low BIIs were more likely to agree with statements such as, "In American contexts, I feel that my Asian side is left out, underemphasized, unrecognized, or unaffirmed." The potential exclusion of the noncued identity leads Low BIIs to activate the noncued identity. Indeed, feelings of identity "exclusion" were found to mediate the contrastive response of Low BIIs (Mok & Morris, 2013). In this sense, Low BIIs are driven by the motive of retaining the unprimed identity, such that the unprimed identity is also activated, accounting for the contrast effects observed.

Although different arguments have been put forth for the psychological mechanism underlying the contrast effect, it is not the goal of this article to determine the exact psychological mechanism that accounts for the contrast effect. Rather, the review on these different perspectives in this section aims to highlight the fact that individuals who exhibit the contrast effect may employ more cognitive effort when primed with identity cues, regardless of what their motive may be.

Female Professionals and G-PII

Like biculturals, females within masculine sex-typed professions, such as STEM, where they are likely to experience acute conflict between their gender and professional identities (Hood & Koberg, 1994; Mcllwee & Robinson, 1992). Females are commonly associated with communal characteristics, such as being affectionate, kind, helpful, sensitive, and nurturing (Eagly, 1987; Fiske, 1998; Hofstede, 1994;Costa, Terracciano, & McCrae, 2001; White & Gardner, 2009), while professionals are commonly associated with agentic traits that are also, stereotypically, associated with men, such as assertiveness, competence, and confidence (Schein, 1975; Schein, Mueller, & Jacobson, 1989; Schein & Mueller, 1992). As such, female professionals often have to deal with the incongruence between their gender and professional identities, especially in their workplaces.

Females differ in the way they deal with the incongruent expectations. On one hand, the conflicting expectations drove some females to choose one identity over the other (Marshall, 1984). Qualitative interviews conducted with female employees within masculine jobs (e.g., engineering and mining), showed that some female employees chose their professional identity so as to be perceived as competent, whereas some chose their female identity to be perceived as warm (Kyriakidou, 2011). On the other hand, some females are comfortable with their conflicting roles. Marshall (1984) reported that some females seemed untroubled with being a female and a manager even though they were aware of the conflict

between their identities. Kyriakidou (2011) also reported that some female engineers were comfortable being in a male-dominated environment. These female engineers exhibited relatively more masculine displays at certain times, such as speaking up and being assertive, but they also exhibited femininity at other times.

G-PII and Identity Frame Switching

To understand the different behaviours exhibited by females in coping with their conflicting social identities, Sacharin et al., (2009) applied the concept of identity integration and proposed the term, gender-professional identity integration (G-PII) to capture the degree of perceived compatibility between gender and professional identities. Similar to II, Sacharin et al. (2009) proposed that females with higher identity integration perceive their two identities as compatible and complementary, and do not find it problematic to identify strongly with two groups simultaneously. In contrast, individuals with lower identity integration perceive an incompatibility between their two identities such that they feel caught between the two identities and prefer to keep them separate, despite the fact that they strongly identify with both identities.

Past studies on G-PII have consistently demonstrated the influence of level of G-PII on people's behaviours in response to identity cues via the cognitive mechanism of frame switching. Sacharin and colleagues' (2009) study on the influence of G-PII on information processing of female employees in relation to tasks and relationships found that female business school students who perceive their female and business identities as compatible (i.e., high G-PIIs) behaved in a less task-oriented manner when exposed to a female prime than when exposed to a business prime. Hence, an assimilative effect was displayed for those who were high G-PIIs. Conversely, female business school students who perceived their female and business identities as in conflict (i.e., individuals with low G-PII) were more task-oriented when they were exposed to a female prime than when they were exposed to a

business prime. Hence, a contrast effect was displayed for those who were individuals with low G-PII.

Mok and Morris (2012b) also examined the influence of G-PII in the domain of attentional focus. Females, compared to males, are proposed to be less able to separate objects from their context visually due to an interdependent self-construal (Phillips, Chapman, & Berry, 2004). Lawyers, on the other hand, should fare better on tasks that require them to separate objects from their context visually. The study found the same assimilative and contrast effects, such that female lawyers with high G-PIIs were more attentive to focal objects after being primed with a lawyer cue than after being primed with a female cue, and the reverse pattern was found for those with low G-PIIs. Cheng and Tan's (2014) study on female business students and negotiations exhibited similar pattern of findings such that females business students with higher levels of G-PII displayed lower levels of cooperative tendency and are more likely to make counteroffers during a negotiation task when primed with business primes than with gender primes, while female business students with lower levels of G-PII showed the reverse behaviors. These studies essentially demonstrate that level of G-PII of female professionals has an impact on their cognitive process that subsequently leads to them displaying different behaviours.

G-PII and Stereotype Threat

Given that females react differently to identity cues as a function of their level of G-PII, how female professionals behave when a favourable identity in made salient in times of stereotype threat may not be as straightforward as observed in the current literature.

Firstly, females with varying levels of G-PII react to identity cues differently. Shih et al. (1999) demonstrated that female Asian students performed better at a math test when their Asian identity was made salient compared to when their gender was made salient. Taking into account the individual difference of G-PII, this may not be uniform across all female

professionals. Since individuals with higher II will exhibit assimilative effects, they would perform worse at a math test when their gender identity is made salient and would perform better at a math test when their professional identity (i.e., more favourable identity) is made salient. However, individuals with low II will exhibit contrast effects, they would perform worse at a math test when their professional identity in made salient and would perform better when their gender identity is made salient.

Secondly, females with varying levels of G-PII expand cognitive effort differently in processing identity cues during stereotype threat, which may then influence their performance on a subsequent task. Steele and Aronson (1995) argued that when individuals are faced with the threat of confirming to a negative stereotype, the threat triggers a variety of mechanisms that interferes with subsequent performance. Stereotype-threat researchers have argued that deficits in subsequent performance can be attributed to the reduced cognitive resources that stems from physiological, cognitive, and affective processes (please see Schmade, Johns, & Forbes, 2008 for a review). Rydell et al. (2009) demonstrated that the salience of a favourable identity during stereotype threat can help females cope with stereotype threat by freeing up and redirecting the cognitive resources to the performance task. Their findings showed that when females' college identity was made salient during stereotype threat, females identified with their college identity more than their gender identity. The salience of the college identity frees up the cognitive resource that would have been used to monitor their behaviours and their environment, and deal with the anxiety aroused from the threat, to the performance task (Rydell et al., 2009). As such, the increased accessibility of their college identity allowed these female college students to perform better at a math test than those who were only reminded of their gender identity.

Taking into account G-PII, females with varying levels of G-PII use different amount of cognitive effort in processing identity cues. Given that individuals with lower levels of

identity integration view their identities as highly distinct and potentially conflicting, they are more likely to be more vigilant towards identity cues and will process identity cues more. The salience of both their gender and professional identities may arouse feelings of conflict, which may then induce additional cognitive stress, taking up cognitive resources which could have been use on a subsequent performance task. Hence, rather than assisting individuals in coping with stereotype threat, reminding them of an additional conflicting identity may harm females with low identity integration as it uses up the cognitive resources, that could have been used in a subsequent math performance task, to process identity cues.

Chapter 5. THE PRESENT RESEARCH

The goal of this research is to examine whether females with differing levels of G-PII benefit differently when a favourable identity (i.e., an identity they possess which is associated with a positive stereotype in quantitative abilities) is made salient during stereotype threat. I argued that the individual difference of G-PII play a critical role in influencing the behaviours of females when faced with identity cues. Specifically, I predicted that making a favourable identity salient during stereotype threat is more beneficial for females with higher levels of G-PII than for females with lower levels of G-PII.

Previous studies concluded that the presence of a favourable identity allowed females to cope with stereotype threat (e.g., Shih et al., 1999; McGlone & Aronson, 2006; Rydell et al., 2009). However, these studies did not take into account that females differ in the way they react to identity cues, hence it is not possible to ascertain how females differ in employing such a strategy to reduce the aversive effects of stereotype threat. Moreover, the existing research has only examined the reactions of female Asian students (Shih et al., 1999), and female college students (Rydell et al., 2009), where the dual identities of the participants are not necessarily in conflict, which possibly accounted for the assimilation

effects observed in the studies (e.g., performing better in a math test when their Asian identity or college identity is primed). It is possible that the findings may not apply to females in STEM fields where there is likely to be perceived conflict between their dual gender and professional identities.

To address these issues by taking the individual difference of G-PII into account on top of manipulating identity cues, this research aimed to further the understanding of the use of multiple identities and stereotype threat across two experimental studies.

Study 1 sought to demonstrate that females react differently to identity cues as a function of their level of G-PII. By priming females with either their gender or their professional identity, Study 1 explored the moderating effect of G-PII on the relationship between primed identities and math performance. Specifically, I predicted that females with higher levels of G-PII will exhibit assimilative effects such that the salience of their professional identity leads to better math performance. Conversely, I predicted that females with lower levels of G-PII will exhibit contrast effects such that the salience of their professional identity leads to decrements in math performance.

Given that females react to identity cues differently as evidenced in Study 1, Study 2 explored the influence of G-PII on the benefit of making a favourable identity salient during stereotype threat. In Study 2, both females' gender identity and their professional identity will be made salient before they worked on a math test. Similarly, I predicted that females with lower levels of G-PII to suffer in their performance when both their gender and professional identities were made salient. Additionally, Study 2 sets out to investigate the underlying mechanism that accounts for the different performance outcomes observed. I predicted that for females with lower levels of G-PIIs, they perceive their gender and professional identities to be in conflict, as such, they spend more cognitive resources in processing the multiple identities that are activated, subsequently leading to poorer math performance.

Chapter 6: STUDY 1

Study 1 served to highlight the critical role of G-PII in influencing how females react when primed with identity cues. Shih et al. (1999) proposed that individuals access and behave in accordance with a stereotype when the identity associated with the stereotype is made salient. Their findings showed that making the Asian identity of female Asian students salient led to better math performance compared to when their gender identity was made salient. In other words, female participants who were reminded of their Asian identity assimilated to the Asian identity cue, and as a result, their performance was altered in the direction that was predicted by the stereotype associated with the identity, that is, Asians are good at math.

However, the established findings on assimilation and contrast effects suggest that individuals with varying levels of identity integration react differently to identity cues. Rather than all females behaving in accordance to the primed identity, it is likely that females with higher levels of identity integration would behave in accordance to a stereotype when the identity related to that stereotype is made salient while females with lower levels of identity integration would behave in reactance to a stereotype when the identity related to that stereotype is made salient. Moreover, this predicted pattern of findings should only be observed in domains in which females are negatively stereotyped in. On top of being negatively stereotyped in the domain of math (e.g., Spencer et al., 1999; Gunderson, Ramirez, Levine, & Beilock, 2011), some evidence also suggest that females are negatively stereotype in domains involving visual-spatial skills (McGlone & Aronson, 2006). Performance gaps in mental rotation appears to produce large performance gaps in favor of males (Geary, 1995; 1996; McGillicuddy-De Lisi, & De Lisi, 2002), suggesting a visual-spatial inferiority of females. Taken together, Study 1 tested the following hypotheses:

H1: A significant two-way interaction effect between the type of identity cues (female vs. professional vs. control) and level of G-PII on math performance will be observed.

H1a: An assimilation effect will be observed for females with higher levels of G-PII; better math performance will be observed when their professional identity is made salient compared to when their gender identity is made salient.

H1b: A contrast effect will be observed for females with lower levels of G-PII; better math performance will be observed when their gender identity is made salient in comparison when their professional identity is made salient.

H2: The pattern of findings outlined in H1 will only be observed in domains in which females are negatively stereotyped in; differences in performance amongst females with varying levels of G-PII will be observed in a math test and a visual-spatial test, but not in a test in which females are not negatively stereotyped against.

Method

Participants and design. The sample of this study included 123 female undergraduate students (mean age = 20.9, *SD* = 1.4). Given that this study is aimed at investigating the performance of females with identities associated with a negative stereotype and a positive stereotype in the domain of mathematics, all participants are females and were pursuing either a degree, or at least a major, in business, accountancy, or information systems (75 business degree students, 24 information systems degree students, 20 business major students, 4 accountancy students) for a period of time (mean length = 6.7 months, *SD* = 9.0) and were likely to remain in the same field for their future career (mean likelihood = 6.0 on a 7-point Likert scale, *SD* = 1.0), indicating their competence in mathematics. In this way, all participants possessed two identities: a gender identity, associated with a negative stereotype

regarding their quantitative abilities, and a professional identity, associated with a positive stereotype regarding their quantitative abilities.

Participants were recruited through the psychology subject pool or through campus fliers. Participants received either a course credit or monetary compensation of SGD$5 for their participation in this study. In this study, participants were randomly assigned to one of three identity conditions: female identity condition, professional identity condition, or the control condition.

Procedure. Participants first completed the G-PII scale and provided demographic information. After which, they completed a study life questionnaire aimed at making one of their identities salient. Adopting from Shih et al., 1999, identity salience was manipulated by having participants complete different versions of a questionnaire about their school life at their university. Participants randomly assigned to the gender-identity condition indicated their sex and answered questions related to their gender identity. Participants assigned in the professional-identity- condition indicated the major they are pursuing and answered questions related to their major. In the control condition, where neither their gender identity nor professional identity was made salient, participants were asked general questions about student life.

Participants then completed a relatively difficult quantitative reasoning test. Similar to previous studies, a relatively difficult math test was employed in order to observe the effects of stereotype threat (Spencer et al., 1999; O'Brien & Crandall, 2003; Keller, 2007; Nguyen & Ryan, 2008). Additionally, to investigate if performance differences are only observed in tasks related to a negatively stereotyped domain, participants also completed a visual-spatial logic test, a domain where females are found to perform worse in compared to males (McGlone & Aronson, 2006; Geary, 1995; 1996; McGillicuddy-De Lisi, & De Lisi, 2002), and an anagram task, a task which usually measures persistence (Freeman & Muraven, 2010)

and is unrelated to gender stereotypes. The order of which the math test, the visual-spatial test, and the anagram task were presented to participants was counterbalanced.

To check if the identity manipulations worked, participants were asked to recall the questions from the student life survey. Finally, given that the level of identification with social identities play a critical role in influencing the behaviors of individuals with dual identities (see: Sacharin et al., 2009; Cheng et al., 2006), and that domain importance were shown to moderate the effects of stereotype threat (see: Pennington, Heim, Levy, & Larkin, 2016), participants completed questionnaires measuring their level of identification with their gender and professional identities, and how important the domain is to them to control for the potential effects of these variables.

Measures.

G-PII Scale. G-PII was assessed using a 32-item scale adapted from BIIS-1 (Benet-Martínez & Haritatos, 2005) and BIIS-2 (Huynh, 2009) that measures for the perceived compatibility between a female professional's gender and professional identity. Participants responded to statements such as "I feel torn between my gender and professional identities," [$\bar{\alpha} = .88$]. Each item was rated on a 7-point scale (1 = strongly disagree, 7 = strongly agree). The items are listed in Appendix 1.

Identity Salience. This study adapted Shih et al.'s (1999) paradigm by having participants complete different versions of a questionnaire regarding their school life in university. The questionnaires are designed to make salient the identity of interest implicitly, without directly priming the actual stereotype (superior or inferior skills). This is done to reduce potential motivational mechanisms that may interfere with the variables of interest in this study (Levy, 1996, Shih et al., 2002, Nguen & Ryan, 2008). Additionally, this method of inducing stereotype threat is likely to be more generalizable in real-world settings (Rydell et al., 2009).

In the female-identity-salient condition, participants were asked to (a) indicate their gender, (b) describe their preferred choice of outfits, and (c) describe their favourite activities with their female friends. In the profession-identity-salient condition, participants were asked to (a) indicate the major they are currently pursuing, (b) describe their preferred job related to their major, and (c) describe their favourite major-related modules. In the control condition, participants were asked to (a) indicate if they have travelled in the past 3 months, (b) describe their preference for their next trip, and (c) describe their favourite activity they wish to engage in when travelling.

Quantitative Reasoning/ Math Test. Participants were given 15 minutes to complete a math test, consisting of 8 multiple-choice questions drawn from practice tests for the quantitative section of the Graduate Record Examination (GRE). These questions required complex problem solving abilities involving quantitative skills in order to derive the correct answer. Given that previous research has indicated that gender differences in math performance is observed when the math problems were more complex (Hyde, Fennema, & Lamon, 1990; Linberg, Hyde, & Peterson, 2010), and that higher-level quantitative skills is required for high-level STEM careers, this set of questions is suitable for the research question at hand. The dependent variable was the number of correct items. The set of questions are found in Appendix 2.

Logic Test. Participants were given 5 minutes to complete an 8-item Matrix reasoning task, similar to those used in Raven's Progressive Matrices (adopted from Condon & Revelle, 2014). The stimuli were 3x3 arrays of geometric shapes with one of the nine shapes missing. Participants were instructed to identify which of six geometric shapes presented as response choices will best complete the stimuli. The list of items is shown in Appendix 3.

Anagram Task. Adopting from Freeman and Muraven (2010), participants completed 10 anagrams, 8 of which were solvable and 2 of which were unsolvable. Participants were

instructed that they will be working on a series of anagrams. Anagrams were presented one at a time on the computer screen, and participants were unaware of how many anagrams are included in the task. For each anagram, the computer screen displayed the scrambled letters and participants entered their solution in a given text box. Participants clicked an arrow icon to advance to the next screen. Crucially, participants were told that if they could not solve an anagram, they can press the button to advance to the next one, leaving the current anagram unanswered. The number of anagrams participants managed to solve among the solvable anagrams served as the dependent variable. The anagrams are listed in Appendix 4.

Strength of identities. The 20-item strength of identities scale, adapted from Brown et al. (1986) and Levine and Thompson (2004), was used to measure the extent to which participants identified with their gender and professional identities. Participants responded to 10 statements regarding their gender identity (e.g., "I am a person who identifies with being female"), and to another 10 such statements regarding their professional identity (e.g., "I am a person who considers being a professional important"). Participants responded to each statement on a 5-point Likert scale (1= never, 5=very often). Items will be averaged to create a single index of level of identification with 1) their gender identity [$\bar{\alpha} = .74$] and 2) their professional identity [$\bar{\alpha} = 72$], with higher scores indicating higher levels of identification. The items are listed in Appendix 5.

Domain Importance. Domain importance was assessed using the Domain Identification Measure (DIM) developed by Smith and White (2001). The DIM scales use three response formats. The first format asks individuals to rate the extent to which they agree with several items (e.g., I have always done well in math) using a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The second format asks individuals to rate the extent to which several statements describe them (e.g., How much do you enjoy math-related subjects?) using a 5-point Likert scale ranging from 1 (*Not at all*) to 5 (*Very*

much). Finally, individuals are asked to compare themselves with other students on how "good" they are in math. Items will be averaged together to create a single index of domain identification [$\bar{\alpha} = .84$], with higher scores indicating higher identification. The items are listed in Appendix 6. Items were also adapted to form domain identification for the visual spatial task [$\bar{\alpha} = .85$] and the anagram task [$\bar{\alpha} = .85$].

Analysis and Results

Descriptive statistics. Participants in this sample perceive importance in doing well in maths, *M* = 3.04, *SD* = .71, followed by visual-spatial tasks, *M* = 2.88, *SD* = .59, and finally, anagrams, *M* = 2.47, *SD* = .62. More importantly, participants identify with both their gender identity, *M* = 3.92, *SD* = .45, and their professional identity, *M* = 3.68, *SD* = .42, qualifying their statuses as gender-professionals. Descriptive statistics of participants are shown in Table 1.

Correlational analyses show that participants with higher levels of G-PII tend to possess stronger identification with the gender identity, $r = .35$, $p < .01$, and professional identity, $r = .35$, $p < .01$. Given that identification with both identities play a critical role in being a gender-professional, these factors were included as controls in the subsequent analyses. Since participants' scores on G-PII were normally distributed, *M* 3.39, *SD* = .38, *D* (123) = .07, *p* = .20, G-PII was treated as a continuous variable in the subsequent analysis. The correlation between G-PII and other variables is reported in Table 2.

Table 1

Descriptive Statistics of Participants (N=123)

	M	*SD*	*Skewness (SE = .22)*
G-PII	3.39	0.38	0.07
Female identification	3.92	0.45	0.13
Professional identification	3.68	0.42	0.70
Age	20.94	1.345	0.48
Months in major	6.72	8.2	1.28
Career intent	6.00	1.016	-0.95
Domain Identification (math)	3.04	0.71	-0.27
Domain Identification (visual-spatial)	2.88	0.59	-0.31
Domain Identification (anagram)	2.47	0.62	-0.01
Math scores	5.24	1.46	-0.77
Visual-spatial scores	4.63	1.78	-0.20
Anagram scores	4.43	1.63	0.17

Table 2

Correlation Coefficients between Gender-Professional Identity Integration (G-PII) and Other Key Variables

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1. GPII	-											
2. Female identification	.35**	-										
3. Professional identification	.38**	.55**	-									
4. Age	.02	.03	.19*	-								
5. Months in major	.08	.06	.13	.50**	-							
6. Career intent	.18	.19*	.45**	.28**	.18	-						
7. Domain Identification (math)	-.02	-.04	.07	-.04	-.17	.03	-					
8. Domain Identification (visual-spatial)	.10	.02	.01	-.08	-.06	-.01	.06	-				
9. Domain Identification (anagram)	-.03	-.12	-.17	-.06	-.03	-.08	.06	.36**	-			
10. Math scores	-.04	.01	.06	-.03	.05	.14	.33**	.10	.09	-		
11. Visual-spatial scores	-.03	.01	.11	.02	.16	.19*	.219*	.11	-.06	.27**	-	
12. Anagram scores	.08	.09	.05	-.09	.06	-.05	.08	.00	.31**	.28**	.08	-

* $p < .05$. ** $p < .001$

Manipulation check.

Questionnaire Recall. Participants in the gender identity condition indicated that they were asked about their gender and their choice of outfit to school. Participants in the professional identity condition indicated that they were asked about their major. Participants in the control condition indicated that they were asked about their travelling plans. The accurate recall suggests that participants were attentive to the identity cues.

Hypotheses Testing.

Math Performance. To test Hypothesis 1, which predicted that there will be a two-way interaction between type of identity cue and level of G-PI on math performance, a general linear model regression analysis was conducted. Given that domain identification with math was found to influence the susceptibility of stereotype threat, and hence, subsequent math performance (Keller, 2007), domain identification was entered in the first step of the regression analysis. Gender identification and professional identification was also entered into the first step of the regression analysis. Type of identity cue and level of G-PII (mean-centered) were entered in the second step of the regression analysis. The interaction term between type of identity cue and G-PII was entered in the third step of the regression analysis.

The results revealed that there were no significant main effects for both type of identity cue, b = .19, t (117) = 1.27, p = .21, and level of G-PII, b = -.18, t (117) = -.48, p = .63, on math performance. However, the analysis yielded a significant increase in variance in math performance, ΔR^2 = .04, F (1, 116) = 5.02, p = .03, f^2 = .19. As predicted, the interaction term between type of identity cue and G-PII was significant, b = -.91, t (116) = .41, p = .03. A post hoc power analysis was conducted using the software package, GPower (Faul and Erdfelder 1992). The sample size of 123, a 6-predictor variable equation, and a moderate effect size, f^2 = .19 (see Cohen 1977), was used for the statistical power analyses.

The alpha level used for this analysis was $p < .05$. The post hoc analyses revealed the statistical power for this study was .96 for detecting a moderate effect size. Thus, there was adequate power in detecting the interaction effect between type of identity cues and level of G-PII on math performance.

Simple slope analysis was conducted to further understand the interaction effect; the analysis revealed that the effect of identity cues on math performance was driven more by females with lower levels of G-PII, $b = .53$, $t = 2.51$, $p = .01$, CI [.11, .95], than females with higher levels of G-PII, $b = -.15$, $t = -.71$, $p = .48$, CI [- .57, .27]). This indicates that females with lower levels of G-PII were more sensitive to the identity cues, which is consistent with previous findings (Mok & Morris, 2013).

Table 3

Summary of hierarchical regression analysis for type of identity cue and G-PII predicting math performance (N =123)

	b	*SE B*	β	*t*	*P*	ΔR^2
Step 1						
(Constant)	2.64	1.35		1.95	.05	
Female identification	.02	.33	.01	.06	.95	
Professional identification	.13	.36	.04	.36	.72	
Domain Importance (Maths)	.67	.18	.33	3.77	.00	.11**
Step 2						
(Constant)	2.18	1.46		1.49	.14	
Female identification	.04	.34	.01	.13	.90	
Professional identification	.25	.37	.07	.67	.51	
Domain Importance (Maths)	.65	.18	.32	3.64	.00	
GPII	-.18	.37	-.05	-.48	.63	
Condition	.19	.15	.11	1.27	.21	.02
Step 3						
(Constant)	2.39	1.44		1.65	.10	
Female identification	.04	.33	.01	.11	.92	

Professional identification	.22	.37	.06	.60	.55	
Domain Importance (Maths)	.61	.18	.30	3.47	.00	.
GPII	-.15	.37	-.04	-.42	.68	
Condition	.19	.15	.11	1.28	.20	
GPIIXCond	-.91	.41	-.19	-2.24	.03	.04*

Note: * $p < .05$, ** $p < .01$.

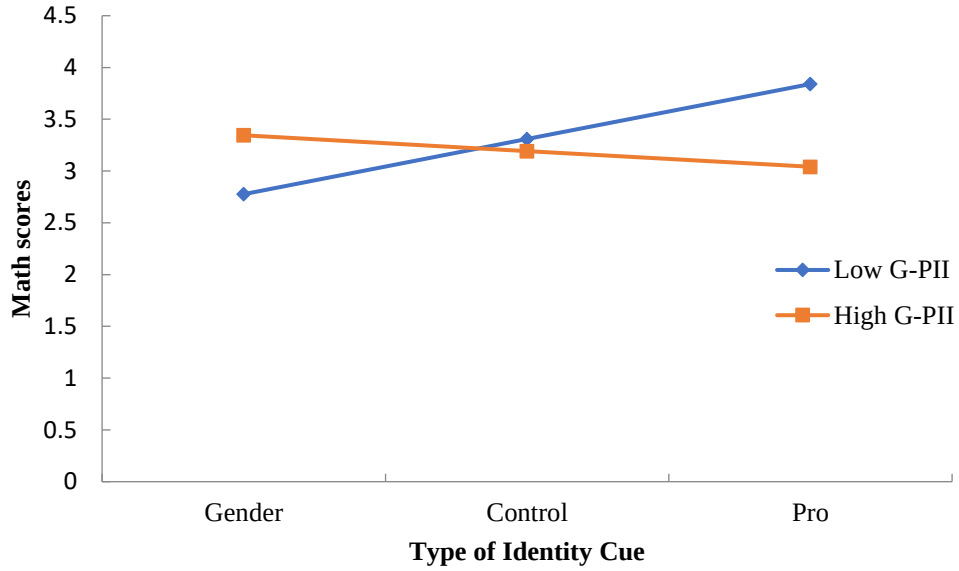

Figure 1. Math scores as a function of type of identity cues and level of G-PII.

Visual-Spatial Performance. To examine if the pattern of findings found for the math test is also observed for visual-spatial task, a similar regression analysis was conducted for the Raven's matrices task. The number of correct responses in the Raven's matrices task served as the dependent variable. Similarly, domain identification with visual-spatiality, gender identification, and professional identification was entered in the first step of the regression analysis. Type of identity cue and level of G-PII (mean-centered) were entered in the second step of the regression analysis, and the interaction term between type of identity cue and G-PII was entered in the third step of the regression analysis. The regression analysis yielded no significant main effects of type of identity cues, b = -.05, t (117) = -.28, p = .78, and level of G-PII, b = -.44, t (117) = -.93, p = .36, on visual-spatial performance. Similarly,

the interaction effect between type of identity cue and level of G-PII on visual-spatial performance was not significant, b = -.48, t (116) = -.90, p = .37.

Table 4

Summary of hierarchical regression analysis for type of identity cue and G-PII predicting visual-spatial performance (N =123)

	b	*SE B*	β	*t*	*p*	ΔR^2
Step 1						
(Constant)	2.48	1.76		1.41	.16	
Female identification	-.28	.42	-.07	-.65	.52	
Professional identification	.62	.45	.15	1.36	.18	
Domain Importance (VS)	.34	.27	.11	1.26	.21	.03**
Step 2						
(Constant)	1.81	1.95		.93	.36	
Female identification	-.20	.43	-.05	-.46	.64	
Professional identification	.70	.47	.17	1.49	.14	
Domain Importance (VS)	.36	.27	.12	1.31	.19	
GPII	-.44	.48	-.09	-.93	.36	
Condition	-.05	.19	-.03	-.28	.78	.007
Step 3						
(Constant)	1.75	1.95		.90	.37	
Female identification	-.20	.43	-.05	-.47	.64	
Professional identification	.68	.47	.16	1.45	.15	
Domain Importance (VS)	.40	.28	.13	1.43	.16	.
GPII	-.44	.48	-.09	-.91	.37	
Condition	-.05	.19	-.03	-.28	.78	
GPIIXCond	-.48	.53	-.08	-.90	.37	.007

Note: * $p < .05$, ** $p < .01$.

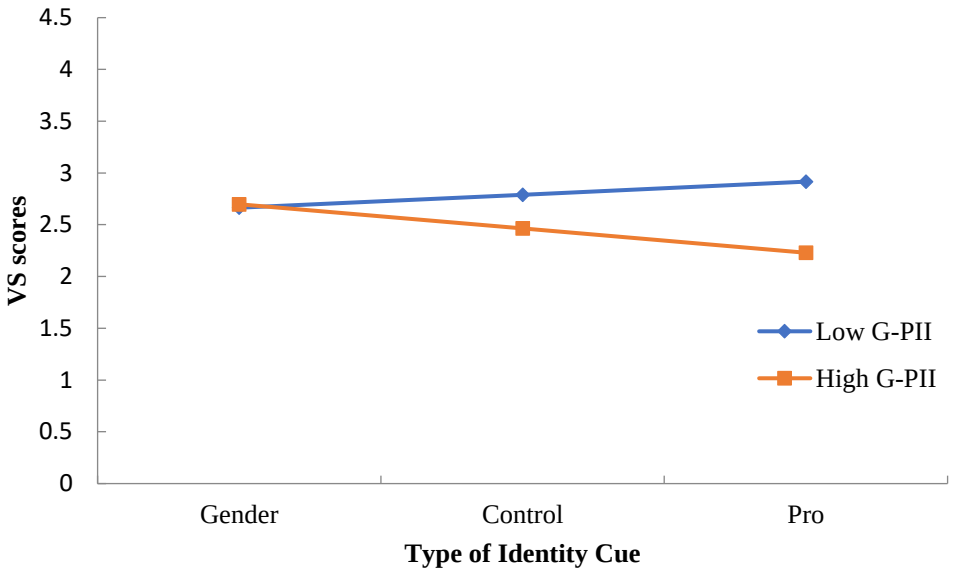

Figure 2. VS scores as a function of type of identity cues and level of G-PII.

Anagram Performance. Again, to examine if a similar pattern of findings is observed for task unrelated to the female stereotype, a similar regression analysis was conducted for the anagram task. The number of correct responses in the anagram task served as the dependent variable. Similar to the results observed for the visual-spatial Raven's matrices task, the regression analysis yielded neither significant main effects of type of identity cue, b = -.03, t (117) = -.17, p = .86, level of G-PII, b = .16, t (117) = .38, p = .70, nor interaction effect between type of identity cue and level of G-PII, b = -.31, t (116) = -.67, p = .51, on visual-spatial performance, suggesting that the differences in performance of females as a result of both the effect of identity cues and G-PII is only evident is the math test, partially supporting Hypothesis 2.

Table 5

Summary of hierarchical regression analysis for type of identity cue and G-PII predicting anagram performance (N =123)

	b	*SE B*	β	*t*	*p*	ΔR^2
Step 1						
(Constant)	.05	1.61		.03	.98	
Female identification	.39	.37	.11	1.04	.30	
Professional identification	.19	.40	.05	.48	.63	
Domain Importance (Anagram)	.88	.23	.33	3.80	.00	.12**
Step 2						
(Constant)	.36	1.77		.20	.84	
Female identification	.36	.38	.10	.94	.35	
Professional identification	.14	.42	.04	.34	.74	
Domain Importance (Anagram)	.87	.23	.33	3.72	.00	
GPII	.16	.42	.04	.38	.70	
Condition	-.03	.17	-.02	-.17	.86	.001
Step 3						
(Constant)	.28	1.77		.16	.88	
Female identification	.36	.38	.10	.94	.35	
Professional identification	.14	.42	.04	.33	.75	
Domain Importance (Anagram)	.90	.24	.34	3.77	.00	.
GPII	.17	.42	.04	.40	.69	
Condition	-.03	.17	-.02	-.17	.86	
GPIIXCond	-.31	.47	-.06	-.67	.51	.003

Note: * $p < .05$, ** $p < .01$.

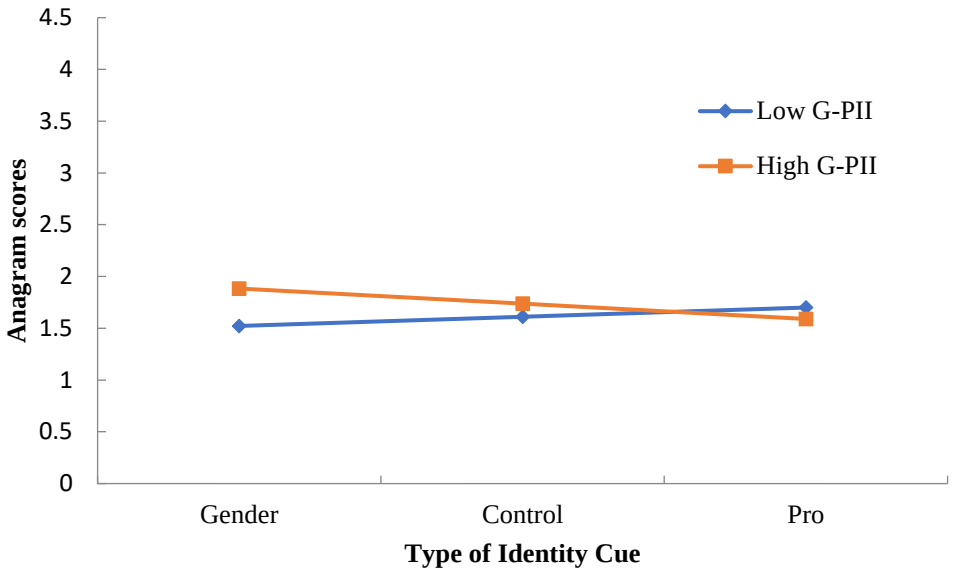

Figure 3. Anagram scores as a function of type of identity cues and level of G-PII.

Discussion

The findings of Study 1 demonstrated that female participants reacted differently to identity cues; essentially supporting Hypothesis 1. However, rather than observing that an assimilation effect for females with higher levels of G-PII (High GPIIs) and a contrast effect for females with lower levels of G-PII (Low G-PII), the results revealed a different pattern.

Results in Study 1 revealed that Low G-PIIs were more influenced by identity cues and behaved in accordance to the stereotype associated with the primed identity; they performed poorly when primed with gender cues and performed better when primed with professional cues. In contrast, given that the significant interaction effect between type of identity cue and level of G-PII on math performance was driven by Low G-PIIs, High G-PIIs seem to be less influenced by the identity cues. Taken together, these results essentially suggest that females are influenced by stereotype threat differently, Low G-PIIs are more sensitive to identity cues, and hence, are more susceptible to stereotype threat as compared to High G-PIIs.

The difference in how identity cues influenced the math performance of Low G-PIIs and High G-PIIs, however, is inconsistent with previous findings where individuals with

lower levels of identity integration tend to exhibit a contrast effect while individuals with higher levels of identity integration tend to exhibit an assimilation effect (Benet-Martinez et al., 2002; Cheng et al., 2006; Mok and Morris, 2009; 2010; 2011; 2012a; 2012b; Sacharin et al., 2009). In this study, Low G-PIIs were influenced by the identity cues and exhibited an assimilation effect, whereby they performed poorly when primed with gender cues and performed better when primed with professional cues. High G-PIIs, in contrast, were not influenced significantly by the identity cues and performed relatively similarly when primed with different identity cues. The lack of finding in the predicted direction could be due to the fact that assimilation and contrast to identity cues is not as straightforward when it comes to the stereotypes associated with the identities.

Prior studies on identity integration did not investigate identity cues in relation to stereotype threats (Benet-Martinez et al., 2002; Cheng et al., 2006; Mok and Morris, 2009; 2010; 2011; 2012a; 2012b), and since this study revealed a different trend from what the existing literature has observed, I draw upon a prior study (Lim & Cheng, 2017) to understand how the process of identity frame switching is influenced when identity cues are related stereotype threats. In Lim and Cheng's (2017) study, participants were asked the extent to which they believed that "female-professionals can only be competent but not warm, or warm but not competent". Their findings revealed a significant negative relationship between level of G-PII and the endorsement of the stereotypic image of a female-professional, $r = -.20$, $p = .03$. This suggests that Low G-IIs are more likely to endorse identity-related stereotypes, which may potentially account for their susceptibility towards identity cues the compared to High G-PIIs as observed in the findings of this study. In other words, it is possible that when identity cues are related to stereotypes, identity frame switching is only observed when females endorse the stereotypes associated with each identity. As this question only served as an exploratory measure, further studies will need to

be conducted to ascertain the influence of stereotype endorsement on the different effect of identity cues between Low G-PIIs and High G-PIIs.

Existing literature examining stereotype threat and multiple identities (Shih et al., 1999; McGlone & Aronson, 2006; Rydell et al., 2009) has only examined the differences in performance of females in domains where females are negatively stereotyped in, specifically in math tests and visual-spatial tests. Rather than focusing on a single domain, this study investigated the performance of females in tasks across domains where they are often stereotyped against (i.e., math and visual-spatial) and in a domain where they are not (i.e., anagram). Indeed, Study 1 revealed that a there is a difference in math performance when females are primed with stereotype threat, demonstrating that the effect of stereotype threat is clearly evident only in this area where the negative stereotype is prevalent. However, contrary to the predictions in Hypothesis 2, where stereotype threat effects will be observed in both the math test and the visual-spatial test (Spencer et al., 1999; Gunderson, Ramirez, Levine, & Beilock, 2011; McGlone & Aronson, 2006), the findings of Study 1 showed that the difference in performance is only evident in the math test, but not in the visual-spatial task and the anagram task, partially supporting Hypothesis 2.

There are two main reasons that may account for why the stereotype threat effect was not observed in the visual-spatial task. First, the visual-spatial measure employed in this study was the Raven's Matrices Task. Even though performance on the Raven's Matrices can be correlated to other tests that measure spatial visualization (e.g., the block test), the Raven's Matrices is primarily considered to be as a non-verbal reasoning measure (Hegarty & Kozhevnikov, 1999), hence it was not the most sensitive measure for observing the stereotype threat effect in the visual-spatial domain. A more-suited visual-spatial measure may be the Vandenberg Mental Rotation Test (VMRT) (Vandenberg, 1971), which requires participants to mentally manipulate the depictions of three-dimensional objects derive at the

correct answer, as evidenced by McGlone and Aronson (2006). Given ability to construct LEGO models is found to be positively related to visual-spatial memory (Nath & Szucs, 2014), future studies can also consider the use the LEGO construction paradigm (Richardson, Jones, & Torrance, 2004) to assess visual-spatial skills, where participants are required to analyze and construct complex LEGO models with progressive difficulty. This measure may be beneficial as it is likely to be novel for the sample of participants (i.e., female undergraduates), hence reducing the likelihood of practice effects derived from the more common visual-spatial tests (e.g., Raven's Matrices), and increasing the level of participants' engagement in the task. Second, it is likely that this pattern of findings was related to the prevalence of gender stereotypes in the sample; it could be possible that Singapore female undergraduates do not hold that belief that females are worse than males in the visual-spatial domain, hence the lack of the predicted findings for the visual-spatial task. To further examine this, further studies measuring the level of stereotype prevalence in math, visual-spatial abilities, and anagrams will need to be conducted.

Given that females with different levels of G-PII react to identity cues, and hence, stereotype threat, differently, it signals the need to consider the level of G-PII when employing multiple identities to cope with stereotype threat. Rydell et al. (2009) proposed that the possession of multiple identities can aid in coping with stereotype threat, that is, by increasing the accessibility of a more favorable identity (i.e., the identity associated with a positive stereotype), individuals are able to buffer the effects of stereotype threat by identifying with the more favorable identity and behaving in accordance to the positive stereotype associated to that identity. However, given different females react differently to identity cues, it is likely that Low G-PIIs and High G-PIIs would differ in their performance when primed with a "favorable" identity. To examine if different females benefit differently

from having their "favorable" identity made salient during stereotype threat, Study 2 is conducted.

Chapter 7: STUDY 2

There are two aims to Study 2; the first aim of Study 2 is to explore the influence of G-PII on the extent females can benefit from the salience of a favorable identity during stereotype threat. In Study 1 where participants were primed with only one identity, Low G-PIIs assimilated to identity cues while High G-PIIs were not significantly influenced by identity cues, suggesting that the level G-PII influences the susceptibility of stereotype threat. Rydell et al. (2009) proposed that females are able to buffer the effects of stereotype threat by increasing the accessibility of a "favorable" identity, allowing females to identify with the favorable identity and subsequently behave in accordance to the positive stereotype associated to that identity. Given that the extent a female is susceptible to stereotype threat is influenced by her level of G-PII, it is likely that the level of G-PII will also influence the effects of an additional primed "favorable" identity under stereotype threat.

The second aim of Study 2 is to investigate the psychological mechanism underlying the effects of identity cues and G-PII on math performance. Rydell et al. (2009) argued that individuals will identify with the identity associated with a positive stereotype when simultaneously primed with both a "favorable" identity and their gender identity. The activation of a favorable identity allowed females to identify more with their favorable identity and inhibit their gender identity during stereotype. The salience of the favorable identity frees up the cognitive resource that would have been used to monitor their behaviours and their environment, and deal with the anxiety aroused from the threat, to the performance task. Essentially, Rydell et al.'s (2009) findings suggest that switching over and identifying with the favorable identity aided females in coping with stereotype threat by

freeing up cognitive resources and redirecting the cognitive resources to the performance task.

However, in Rydell et al.'s (2009) case, the two identities that were made salient are likely to not be in conflict with each other; females are likely to not perceive any conflict between their gender and college identities. In contrast, females in STEM fields are more likely to perceive conflict between their gender and professional identities given the discrepant expectations associated with each identity (Hood & Koberg, 1994; Mcllwee & Robinson, 1992). As such, the underlying process highlighted by Rydell et al., (2009) may only apply when there is no perceived conflict between their gender identity and their favorable identity, but not when females are likely to perceive conflict between the two primed identities (i.e., their gender and professional identities).

The psychological mechanism behind the contrast effect, characteristic of Low G-PIIs, is a manifestation of perceiving their identities as oppositional and in conflict (Benet-Martinez et al., 2002; Phinney & Devich-Navarro, 1997; Vivero & Jenkins, 1999). Due to the conflict and differences they perceive between their identities, Low G-PIIs are hypervigilant towards identity cues, which leads them to exhibit psychological reactance to the identity cues present. The added monitoring and processing of identity cues suggests that individuals with lower levels of identity integration will face a harder time switching to identify with the favorable identity when both gender and professional identities are made salient.

In other words, even though the findings of Study 1 suggest that Low G-PIIs will stand to benefit when their favorable identity is made salient, the fact that they would spend more cognitive resources in switching over to the more favorable identity when two identities are simultaneously primed will instead lead to poorer math performance. I argue that performance difference is accentuated when the two identities made salient are in perceived conflict with each other.

Hence, taken together, Study 2 will test the following hypotheses:

H3: There will be a two-way interaction between the types of identities made salient (Female-professional vs Female-college vs Female-only) and the level of G-PII on math performance.

H3a: When females are simultaneously primed with a favorable identity that is not in perceived conflict with their gender identity (i.e. when both college and gender identities are primed, there will be an improvement in math performance, consistent with Rydell's et al. (2009) finding. It is also expected that there will not be a difference in math performance amongst Low G-PIIs and High G-PIIs.

H3b: When females are only primed with their gender, Low G-PIIs will perform worse than High G-PIIs, similar to the findings of Study 1.

H3b: When females are simultaneously primed with a favorable identity that is in perceived conflict with their gender identity (i.e. when both professional and gender identities are primed, a decrement in math performance will be observed. Specifically, the difference in performance between Low G-PIIs and High G-PIIs will be attenuated; Low G-PIIs are expected to have worse math performance compared to High G-PIIs.

H4: There will be a two-way interaction between the types of identities made salient (Female-professional vs Female-college) and the level of G-PII on the amount of cognitive resources used when two identities are simultaneously primed.

H4a: It is expected that Low G-PIIs and High G-PIIs employ similar levels of cognitive resources when processing college and gender identity cues simultaneously.

H4b: Low G-PIIs are expected to employ more cognitive resources compared to High G-PIIs when processing professional and gender identity cues simultaneously.

H5: Cognitive resources taken up by processing identity cues will predict subsequent math performance; more cognitive resources used will result in poorer math performance. The effect of identity cues on subsequent math performance is mediated by the amount of cognitive resources used to process identity cues. And most importantly, this mediation is moderated by the level of G-PII.

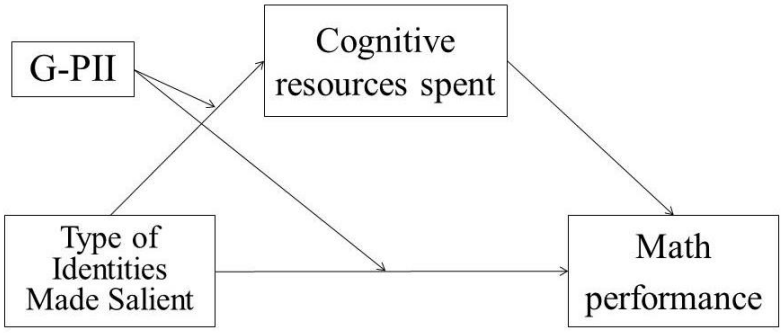

Figure 4. Proposed moderated mediation model between level of G-PII, type of identities made salient, cognitive resource taken to switch to professional identity, and math performance.

Method

Participants and design. The sample of this study included 172 female undergraduate students (mean age = 21.4, *SD* = 1.2). Given that this study is aimed at investigating the performance of females with identities associated with a negative stereotype and a positive stereotype in the domain of mathematics, all participants are females and were pursuing either a degree, or at least a major, in business (120 business degree students, 52 students with a business major) for a period of time (mean length = 6.5 months, *SD* = 8.5) and were likely to remain in the same field for their future career (mean likelihood = 6.2 on a 7-point Likert scale, *SD* = 0.7), indicating their competence in mathematics. In this way, all participants possessed a gender identity, a professional identity, and a college identity (i.e., by virtue of being an undergraduate student in the university).

Participants were recruited through the psychology subject pool or through campus fliers. Participants received either a course credit or monetary compensation of SGD$5 for their participation in this study. In this study, participants were randomly assigned to one of three identity conditions: female-professional condition, female-college condition, or the female-only condition.

Procedure. Participants first completed the G-PII scale and provided demographic information. Participants were randomly assigned to one of the three conditions: *Female-college-salient* condition where their gender and college identities were activated, female-*professional-salient* condition where their gender and professional identities were activated, or the *female-only* condition where only their gender identity was activated. Following Study 1, identities were made salient through the use of a questionnaire regarding student life.

Participants then worked on the female versus professional accessibility task before completing a relatively difficult quantitative reasoning test, similar to the one used in Study 1. To check if the identity manipulations worked, participants were asked to recall the questions from the student life survey. Finally, to control for the potential effects of these variables, participants completed questionnaires measuring their level of identification with their gender and professional identities, and how important math is to them.

Measures.

G-PII Scale. Similar to Study 1, participants completed the G-PII scale, a 32-item scale measuring the perceived compatibility between a female professional' s gender and professional identity. Participants responded to statements such as "I feel torn between my gender and professional identities" on a 7-point scale (1 = strongly disagree, 7 = strongly agree) [$\bar{\alpha} = .88$].

Identity Salience. In the *female-professional-salient* condition, participants answered questions related to both their gender and professional identities. Participants were asked to

(a) indicate their gender, (b) describe their preferred choice of outfits, (c) describe their favourite activities with their female friends, (d) to indicate the major they are currently pursuing, (e) describe their preferred job related to their major, and (f) describe their favourite major-related modules . Participants assigned to the *female-college-salient* condition were required to (a) indicate their gender, (b) describe their preferred choice of outfits, (c) describe their favourite activities with their female friends, (d) indicate which year of college they are in, (d) describe their preference for this particular college, and (e) describe their favourite college event. Participants assigned to the *female-only* condition were required to (a) indicate their gender, (b) describe their preferred choice of outfits, and (c) describe their favourite activities with their female friends.

Amount of cognitive resources spent. Adapting from Rydell et al., (2009), a me/not me task was employed to measure the amount of cognitive resources spend in processing the identity cues. This task consisted of 80 trials in which a target word was presented at the center of the computer monitor and participants indicated whether the word was related to the self (me) (by pressing the m key on the keyboard) or unrelated to the self (not me) (by pressing the n key on the keyboard). The response latencies for different types of target words were the dependent variable of interest.

For participants assigned to the female-professional condition, there were three categories of words presented in the me/not me task: 5 female words (miss, girl, woman, female, lady), 5 professional words (business, finance, corporate, businessperson, revenue), and 8 unrelated words (e.g. feather, coin, cup, hand, lid, window, stump, day). Each female word and each student word was be presented four times each (20 total presentations for each word type), and each of the 8 unrelated words was be presented five times each for a total of 40 unrelated word trials. Following Rydell et al., (2009), only the results for response

latencies from the female and professional words in which a me response were measured; this was done in order to ensure that these words were indeed associated with the self.

For participants assigned to the female-college condition, there were three categories of words presented in the me/not me task: 5 female words (miss, girl, woman, female, lady), 5 college words (student, undergrad, SMU, university, Bachelor), and 8 unrelated words (e.g. feather, coin, cup, hand, lid, window, stump, day). Similarly, each female word and each student word was presented four times each (20 total presentations for each word type), and each of the 8 unrelated words was presented five times each for a total of 40 unrelated word trials. Following Rydell et al., (2009), only the results for response latencies from the female and college words in which a me response were measured.

For conditions where dual identities were simultaneously activated (i.e., Female-professional and Female-college), s Relative Accessibility score (RA) was recorded, this score is derived from subtracting the response latencies for female words from the response latencies for professional/college words. Greater RA scores indicated more time spent processing the identity cues.

Quantitative Reasoning/ Math Test. Participants were given 15 minutes to complete a math test, consisting of 8 multiple-choice questions drawn from practice tests for the quantitative section of the Graduate Record Examination (GRE). The set of questions used in this study was similar to the one employed in Study 1. Items have been modified in order to reduce potential practice effects from participants. The dependent variable was the number of correct items.

Strength of identities. Participants completed the 20-item scale used in Study 1 to measure the level to which they identity with their gender and professional/college/ethnic identity. Participants responded to 10 statements regarding their gender identity and 10 statements regarding their professional identity. Participants indicated how often each

statement about their identities apply to them in general on a 5-point Likert scale (1= never, 5=very often). Items were averaged to create a single index of level of identification with 1) their gender identity [$\bar{\alpha} = .81$] and 2) their professional identity [$\bar{\alpha} = .79$], with higher scores indicating higher levels of identification.

Domain Importance. Domain importance was assessed using the Domain Identification Measure (DIM) (Smith & White, 2001) that was also used in Study 1. Participants rated the extent to which they agree with several items (e.g., I have always done well in math) using a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*), rated the extent to which several statements describe them (e.g., How much do you enjoy math-related subjects?) using a 5-point Likert scale ranging from 1 (*Not at all*) to 5 (*Very much*), and asked to compare themselves with other students on how "good" they are in math. Items were averaged together to create a single index of domain identification, with higher scores indicating higher identification [$\bar{\alpha} = .83$].

Analysis and Results

Descriptive statistics. Participants in this sample perceive importance in doing well in maths, $M = 2.93$, $SD = .74$. Participants identify with both their gender identity, $M = 4.09$, $SD = .47$, and their professional identity, $M = 3.83$, $SD = .45$, qualifying their statuses as gender-professionals. Descriptive statistics of participants are shown in Table 6.

Correlational analyses show that participants with higher levels of G-PII tend to possess stronger identification with the gender identity, $r = .42$, $p < .01$, and professional identity, $r = .42$, $p < .01$. Given that identification with both identities play a critical role in being a gender-professional, these factors were included as controls in the subsequent analyses. The correlation between G-PII and other variables is reported in Table 7.

Table 6

Descriptive Statistics for Participants (N=172)

	M	*SD*	*Skewness (SE = .19)*
G-PII	3.46	0.38	0.00
Female identification	4.09	0.47	-0.21
Professional identification	3.83	0.45	0.26
Age	21.24	1.23	0.14
Months in major	6.53	8.46	1.25
Career intent	6.17	0.95	-1.23
Domain Identification (math)	2.93	0.74	-0.04
Math score	4.85	1.70	-0.28
Relative Accessibility (RA) score	103.94	256.24	0.68 *(SE = .23)*

Table 7

Correlation Coefficients between Gender-Professional Identity Integration (G-PII) and Other Key Variables (N=172)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1. GPII	-								
2. Female identification	.42**	-							
3. Professional identification	.42**	.54**	-						
4. Age	.08	.02	.08	-					
5. Months in major	-.02	.03	.03	.50**	-				
6. Career intent	.02	-.02	.28**	.08	-.01	-			
7. Domain Identification (math)	.00	.04	.10	-.08	.02	.11	-		
8. Math score	.05	.11	.08	-.10	-.04	.06	.31**	-	
9. Relative Accessibility (RA) score	-.04	.04	-.08	.04	.01	.04	.22*	.16	-

* $p < .05$. ** $p < .001$

Manipulation check.

Questionnaire Recall. Participants assigned to the *female-professional* condition indicated that they were asked about their gender and their major. Participants assigned to the *female-college* condition indicated that they were asked about their gender and their school life. Participants assigned to the *female-only* condition indicated that they were asked about their gender. This suggests that the participants were attentive to the identity cues.

Quantitative Reasoning/Math Performance. To test Hypothesis 3, which predicted that there will be a two-way interaction effect between types of identities made salient and G-

PII on math performance, a general linear model regression analysis was conducted. Similar to Study 1, domain identification with math, gender identification, and professional identification were entered into the first step of the regression analysis. Type of identities made salient and level of G-PII (mean-centered) were entered in the second step of the regression analysis. The interaction term between type of identities and level of G-PII was entered in the third step of the regression analysis.

No significant main effect of type of identities made salient, b = -.15, t (166) = -.96, p = .34, and level of G-PII, b = .10, t (166) = .26, p = .80, on math performance was observed. The interaction effect between type of identities and G-PII on math performance was also not significant, b = .24, t (165) = .63, p = .53, indicating that Hypothesis 3 is not supported. Despite the lack of significant findings, the results show patterns of findings consistent to the predictions of Hypothesis 3 (Figure 5). Simple slope analyses revealed that the effect of G-PII on math performance was the most evident in the female-professional condition, b = .34, t = .63, p = .53, CI [-.72, 1.41], where gender and professional identities are likely to be in conflict, compared to the female-college condition, b = -.06, t = -.12, p = .90, CI [-.94, .82], where gender and college identities are likely to not be in conflict. Although the result was not statistically significant, females with lower levels of G-PII indeed performed worse (M = 2.60) in the math test compared to females with higher levels of G-PII worse (M = 2.88) in the female-professional condition. Additionally, simple slope analysis also showed that the effect of types of identities made salient on math performance is more evident for females with lower levels of G-PII, b = -.25, t = -1.12, p = .26, CI [-.68, .19] compared to females with higher levels of G-PII, b = -.06, t = -.32, p = .75, CI [-.47, .34], suggesting that females with lower levels of G-PII are more sensitive towards identity cues.

Table 8

Summary of hierarchical regression analysis for type of identity cue and G-PII predicting math performance (N =172)

	b	*SE B*	B	*t*	*p*	ΔR^2
Step 1						
(Constant)	1.42	1.29		1.10	0.27	
Female identification	0.35	0.31	0.10	1.10	0.27	
Professional identification	-0.01	0.33	0.00	-0.03	0.98	
Domain Importance (Maths)	0.71	0.17	0.31	4.17	.00	.10**
Step 2						
(Constant)	1.82	1.47		1.24	0.22	
Female identification	0.29	0.33	0.08	0.87	0.38	
Professional identification	-0.06	0.34	-0.02	-0.19	0.85	
Domain Importance (Maths)	0.72	0.17	0.31	4.24	< .01	
GPII	0.10	0.37	0.02	0.26	0.80	
Condition	-0.15	0.16	-0.07	-0.96	0.34	.005
Step 3						
(Constant)	1.99	1.50		1.33	0.19	
Female identification	0.28	0.33	0.08	0.84	0.40	
Professional identification	-0.10	0.35	-0.03	-0.28	0.78	
Domain Importance (Maths)	0.73	0.17	0.32	4.24	.00	.
GPII	0.12	0.38	0.03	0.33	0.74	
Condition	-0.16	0.16	-0.08	-1.00	0.32	
GPIIXCond	0.24	0.38	0.05	0.63	0.53	.002

Note: * $p < .05$, ** $p < .01$.

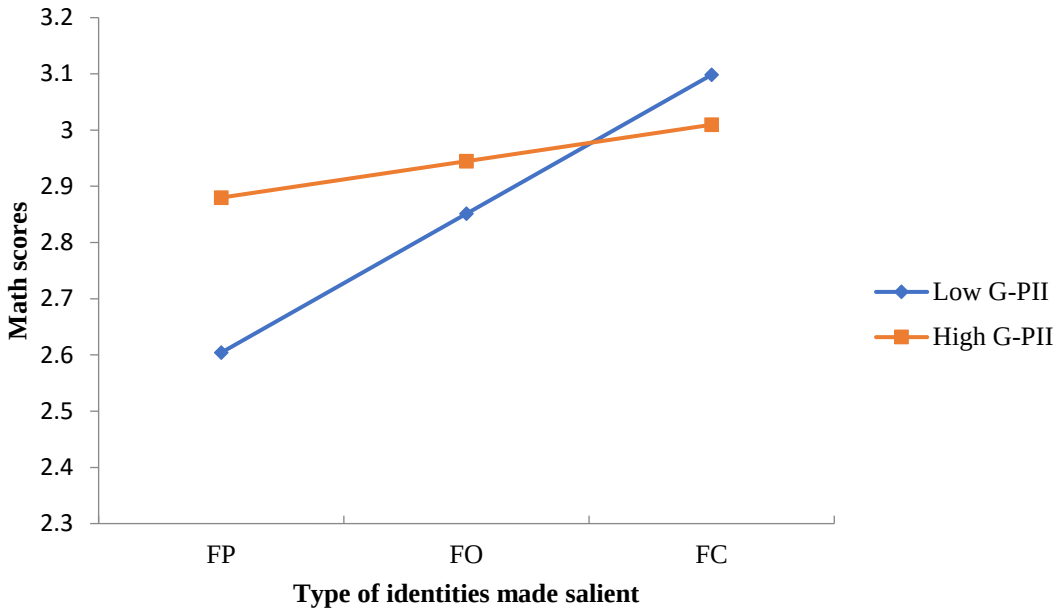

Figure 5. Math scores as a function of type of identity cues and level of G-PII (N=172).

Amount of cognitive resources spent. To test for Hypothesis 4, which predicts that there will be a two-way interaction between the type of identities made salient and level of G-PII on the amount of cognitive resources spent, a general linear regression analysis was conducted with Relative Accessibility (RA) score as the dependent variable. Similar to previous analyses, gender identification and professional identification were entered into the first step of the regression analysis, type of identities made salient and level of G-PII (mean-centered) were entered in the second step of the regression analysis, and finally, the interaction term between type of identities and level of G-PII was entered in the third step of the regression analysis. Only participants who were assigned to the female-professional condition and the female-college condition were included in this analysis.

The analysis did not yield any significant main effects; no significant main effect of type of identities made salient, b = 64.01, t (91) = 1.22, p = .23, and level of G-PII, b = -57.02, t (91) = -.75, p = .45, on RA score was observed. The interaction effect between type of identities and G-PII on RA score was also insignificant, b = -52.67, t (90) = -.39, p = .70, indicating that Hypothesis 4 is not supported. Although there were no significant findings in

this analysis, it is critical to note that Low G-PIIs have higher RA scores compared to females with High G-PIIs, suggesting that they spent more cognitive effort in processing the identity cues.

Table 9

Summary of hierarchical regression analysis for type of identity cue and G-PII predicting RA score (N =96)

	b	*SE B*	β	*t*	*p*	ΔR^2
Step 1						
(Constant)	361.65	258.20		1.40	0.17	
Female identification	24.65	63.69	0.05	0.39	0.70	
Professional identification	-92.03	67.11	-0.16	-1.37	0.17	.02
Step 2						
(Constant)	139.16	312.65		0.45	0.66	
Female identification	45.73	65.80	0.09	0.70	0.49	
Business identification	-65.66	71.82	-0.12	-0.91	0.36	
GPII	64.01	53.32	0.13	1.20	0.23	
Condition	-57.02	75.57	-0.09	-0.75	0.45	.02
Step 3						
(Constant)	116.99	319.16		0.37	0.72	
Female identification	45.82	66.11	0.09	0.69	0.49	
Business identification	-60.36	73.41	-0.11	-0.82	0.41	
GPII	64.98	53.63	0.13	1.21	0.23	
Condition	-34.23	95.55	-0.05	-0.36	0.72	
GPIIXCond	-52.67	134.09	-0.06	-0.39	0.70	.002

Note: * $p < .05$, ** $p < .01$.

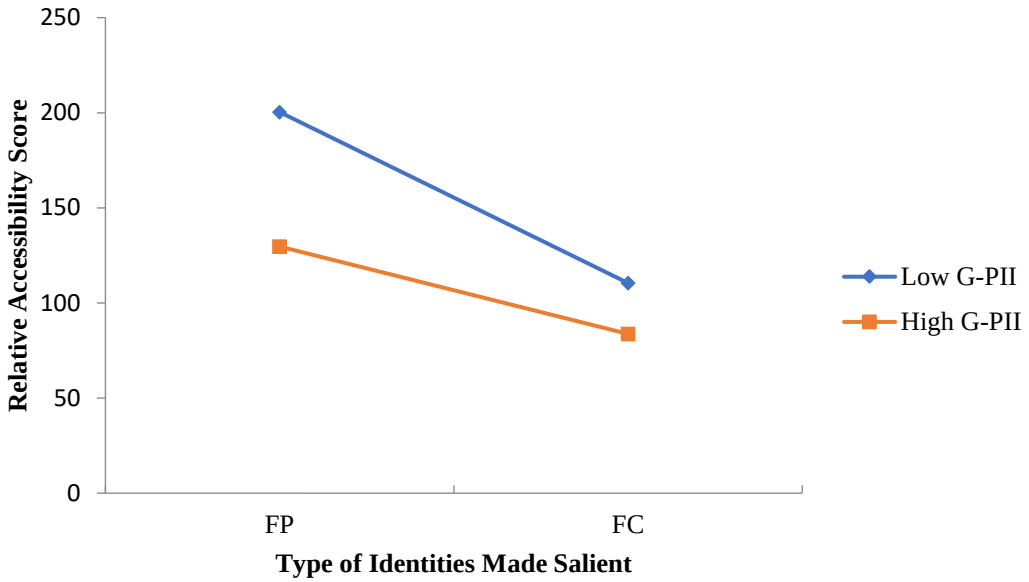

Figure 6. RA scores as a function of type of identity cues and level of G-PII.

Mediation analysis. To test for the proposed moderated mediation model (Figure 4), which predicts the effect of identity cues on subsequent math performance is mediated by the amount of cognitive resources taken to process identity cues, and this process is moderated by level of G-PII, Preacher and Hayes PROCESS model 8 will be employed. Model 8, a moderated mediation model, was used in the analysis, where the type of identities that were made salient was entered as the independent variable, math performance was the dependent variable, and the RA score was entered as the mediator. Level of G-PII (mean-centered) was entered into the Proposed Moderator W field and 10,000 bias corrected.

The analysis revealed that the direct effect (path c) between type of identity made salient and math scores was not significant for both Low G-PII; b = -.32, t = -.64, p = .52, 95 % CI [-1.31, .67]) and High G-PII (b = .40, t = -.43, p = .66, 95 % CI [-1.15, .74]). The indirect effect from type of identities made salient, through cognitive resources spent on processing identity cues, on math score was also insignificant for both Low G-PII (effect = -.40, 95% CI [-.11, .31]) and High G-PII (effect = -.40, 95% CI [-.06, .18]).. The interaction term between type of identities and level of G-PII on cognitive resources spent, b = -.34.52, t

= -.26, p = .80, 95 % CI [-298.99, 229.96], and that on math scores, b = .14, t = .16, p = .87, 95 % CI [-1.56, 1.85], were both not significant. Hence, it can be concluded that Hypothesis 6, the proposed moderated mediation model, was not supported.

Discussion

Although Hypothesis 3, which posited that there will be an interaction effect between types of identities made salient and level of G-PII on math performance, was not supported, the findings of Study 2 were in the expected direction; the biggest difference in math performance of females with varying levels of G-PII is observed in the female-professional condition where the gender and professional identities are likely to be in conflict. Females with lower levels of G-PII performed worse in the math test compared to females with higher levels of G-PII in the female-professional condition. This suggests that that very likely, the level of G-PII has an influence on the effects of an additional primed "favorable" identity under stereotype threat; the salience of an identity associated with a positive stereotype may not necessarily help one to cope with stereotype threat, especially if the identity is perceived to be in conflict with their gender identity.

Additionally, the findings of Study 2 gave an insight into the mechanism underlying the difference in performance among females when multiple identities are activated. When primed with both their gender identity and a "favorable" identity simultaneously, females with varying levels of G-PII spend different amount of cognitive resources to process the dual identity cues. Although Hypothesis 4, which predicted that there will be an interaction effect of the types of identities made salient and level of G-PII on amount of cognitive resources spent, was not statistically significant, the results do indicate a pattern that was consistent with the prediction, that is, Low G-PIIs indeed take a longer time to process identity cues compared to High G-PIIs, and the difference is more pronounced when the identities are in perceived conflict. This difference is amount of cognitive resources spent in

processing identity cues holds significant implications for their performance in a subsequent math test. Study 2 examined this via a moderated mediation model, proposed in Hypothesis 5, but the analysis did not yield a statistically significant finding.

The lack of significant results in Study 2 could be due to the following limitations. Firstly, the sample size in Study 2 may be too small to observe the predicted effects. The total sample size used in the analyses was only 96 participants for the multiple identities conditions. A larger sample size will be recommended in order to substantially conclude the effects of types of identities and level of G-PII on math performance, and cognitive resources, which were predicted in Study 2. Secondly, in the conditions were multiple identities were primed, identity cues primed to participants were counterbalanced. This was initially done to prevent recency effects of the primes but on hindsight, this could potentially interfere with the process of inducing stereotype threat. It could be argued that participants who were primed with the "favorable" identity before their gender identity did not undergo stereotype threat. This could have diluted the effects of the "favorable" identity, explaining why a trend in the direction of the predictions was observed but no significant findings were reported. Nonetheless, the findings of Study 2 demonstrated that there is potential in continuing this line of research.

Chapter 8. GENERAL DISCUSSION

The goal of this paper is to examine whether females with varying levels of G-PII benefit differently when a favorable identity is made salient during stereotype threat. Study 1 demonstrated that females with varying levels of G-PII react to identity cues differently. Low G-PIIs were more influenced by identity cues and behaved in accordance to the stereotype associated with the primed identity; they performed poorly when primed with gender cues and performed better when primed with professional cues. In contrast, High G-PIIs seem to be less influenced by the identity cues. The results essentially suggest that females are

influenced by stereotype threat differently; Low G-PIIs are more sensitive to identity cues, and hence, are more susceptible to stereotype threat as compared to High G-PIIs. Additionally, Study 1 investigated the performance of females in tasks across domains where they are often stereotyped against (i.e., math and visual-spatial) and in a domain where they are not (i.e., anagram), and found that the performance difference between Low G-PIIs and High G-PIIs in relation to identity cues are most evident in the math test where the negative gender stereotype is probably the most prevalent.

Building on this, Study 2 was conducted to examine if females with varying levels of G-PII benefit differently from the salience of a conflicting favorable identity during stereotype threat. Although the findings in Study 2 were not statistically significant, the results showed the predicted directions; the biggest difference in math performance between Low G-PIIs and High G-PIIs is observed in the condition where the additional primed identity is likely to be in perceived conflict with their gender identity (i.e., professional identity), and not in the condition where the additional primed identity is not in perceived conflicted with their gender identity (i.e., college identity). When primed with an additional identity that is in conflict with their gender identity, Low G-PIIs perform a lot worse in their math test compared to High G-PIIs. From Study 1, it is evident that Low G-PIIs already suffer in their math performance when reminded of their gender; Study 2 further demonstrated that the additional primed professional identity do not benefit, but instead, worsen, their math performance. Furthermore, the findings of Study 2 also point towards that fact that Low G-PIIs demonstrated greater response latencies in processing identity cues compared to High G-PIIs, and this is especially evident when identity cues are in conflict (i.e, when the professional identity is made salient on top of the gender identity), indicating that they indeed do spend more cognitive resources. This use of cognitive resources in processing

identity cues could potentially account for their poorer math performance compared to High G-PIIs.

Essentially, the findings of this research highlight the need to consider the level of G-PII when examining stereotype threat and the use of multiple identities in an attempt to cope with stereotype threat. Firstly, Shih et al. (1999) demonstrated that priming female Asian students of their favorable identity (i.e., Asian identity) led to better performance at a math test compared to priming them of their gender identity. While this research also observed that female students had better math performance when primed with their professional identity instead of their gender identity, this was only evident amongst females with lower levels of G-PII. Females with higher levels of G-PII were not significantly influenced by the identity cues. Evidently, the influence of identity cues is not uniform across all females. If the individual difference of G-PII was taken into account, it can be observed that females with lower levels of G-PII are more influenced by identity cues compared to females with higher levels of G-PII.

Next, Rydell et al. (2009) proposed that the salience of a favorable identity during stereotype threat can help females cope with stereotype threat by freeing up and redirecting the cognitive resources to the performance task. This was not observed in this research; instead, this research suggests that the simultaneous priming of their gender identity and a favorable identity, especially when these identities are in perceived conflict, harmed their math performance rather than helping their performance. Especially since females with lower levels of G-PII view their gender and professional identities as highly distinct and conflicting, they expand more cognitive effort to process the both identity cues. For these females, making an additional conflicting identity salient harmed them more than just reminding them of their gender identity; they use up more cognitive resources that could have been used in a subsequent math performance task to process the conflicting identity cues.

Hence, these results imply that it is necessary to consider females' level of G-PII in order to effectively help females cope with stereotype threat and avoid decrements in math performance. It is critical to recognize that it is not about the possession of an additional "positive" identity, but rather, it is the perceived compatibility between the dual identities that would influence the performance of females under stereotype threat.

Theoretical Implications

The findings of this paper expanded the current understanding of using multiple identities to alleviate the aversive effects of stereotype threat (Shih et al., 1999; McGlone and Aronson, 2006; Rydell et al., 2009). Rydell et al., (2009) argued that making salient a favorable identity will help in stereotype threat as the accessibility of a favorable identity during stereotype threat frees up and redirects cognitive resources, which would have been used to cope with the evaluation apprehension, to the subsequent performance task. The findings of the studies in this paper complemented previous findings in that certain females do indeed benefit from having their favorable identity made salient during stereotype threat.

More critically, this paper married two lines of research with the aim of furthering the understanding of the stereotype threat. Rather than just recognising the multiple social identities females possess (Shih et al., 1999; McGlone and Aronson, 2006; Rydell et al., 2009), this paper considered the interrelationships amongst the multiple group identities. Employing this concept of social identity complexity, the findings of this paper demonstrated that not *all* females benefit from such a strategy, especially when the favorable identity is in perceived conflict with the female gender identity. Females with lower levels of G-PII performed worse than what they would have when they were only primed with their gender identity with the salience of an additional "favorable" identity. My research demonstrated that the salience of a "favorable" identity, one with perceived conflict with their gender identity, lead females with lower levels of G-PII to spend more cognitive resources in

processing the identity cues, which may subsequently influence their math performance. In contrast, the performance of females with higher levels of G-PII was not influenced by the identity cues they were primed with, suggesting resilience from stereotype threat. Overall, these findings suggest that, in the attempt of using a favorable identity to alleviate the aversive effects of stereotype threat, it is not simply to prime females with advantageous identity cues, but to also take into account the individual difference of G-PII. Essentially, these findings provide new understanding towards the influence and coping of stereotype threat.

Additionally, my findings provided evidence for the different amount of cognitive resources used by females with lower levels of G-PII and females with higher levels of G-PII in processing multiple identity cues, which may shed some insight into the cognitive usage behind assimilation and contrast effects. Benet-Martínez et al. (2002) initially suggested that more cognitive effort is exerted by biculturals with lower levels of identity integration who perceive conflict between their identities and are likely to process primes or cues in the environment to a greater extent. The findings in this research implied that, females with lower levels of G-PII spend more cognitive resources in processing multiple identity cues, especially when identity cues are likely to be in perceived conflict, compared to females with higher levels of G-PII.

While this research did not observe contrast effect amongst females with lower levels of G-PII, and the assimilation effect amongst females with higher levels of G-PII as found in previous identity integration literature (e.g., Benet-Martinez et al., 2002; Sacharin et al., 2009; Mok & Morris, 2012b), this lack of findings also gave unique insights to the workings of assimilation and contrast effects. It is likely that assimilation and contrast to identity cues is not as straightforward when it comes to the stereotypes associated with the identities. Drawing upon a prior study by Lim and Cheng (2017), females with lower levels of G-PII are

more likely to endorse identity-related stereotypes than females with higher levels of G-PII, potentially accounting for their heightened sensitivity towards identity cues related to stereotypes. When it comes to stereotype threat, it is likely identity frame switching is only observed when females endorse the stereotypes associated with each identity. More research will have to be conducted to examine this possibility, but the finding of this research opens a promising new avenue of research regarding identity integration and stereotype threat studies.

Practical Implications

The present findings also have implications for understanding the social adjustments of females in STEM fields. Even though Rydell et al., (2009) found that it is adaptive for females to be reminded of their favourable identity during stereotype threat, my findings demonstrated that it may be maladaptive for some females, specifically, females with lower levels of G-PII and the type of favourable identity primed matters. The findings of this paper demonstrated the importance of G-PII as it affects the way interventions can be designed and implemented to help females in STEM fields cope with stereotype threat, especially for females with lower levels of G-PII given their heightened sensitivity towards identity cues. This can be achieved via two approaches; the first approach takes on a developmental stance and is aimed at removing the conflict females may potentially experience, and the second approach is aimed at providing reminders for females to help them perform better at a given point of time.

Perceived conflict between females' gender identity and professional identity can be managed, and ideally eliminated, from early experiences. Cheng and Lee (2009; 2013) demonstrated that the level of identity integration is malleable; creating an environment that affords for more positive experiences about being a female in a STEM field can increase level of G-PII. This can be achieved by affirming female students of their math and professional abilities, providing successful female professional role models, and highlighting

the unique contributions that can only made by female professionals (e.g., mobile communication devices with unique features; Cheng, Sanchez-Burks, & Lee, 2008). As evidenced in this paper, females with higher levels of identity integration are less susceptible to the effect of stereotype threat, hence it is imperative that education institutes and organizations can employ such a strategy and play a role in helping females in STEM field with their dual identity developmental processes.

Given the male-dominated environment of STEM fields may constantly activate negative stereotypes on females (Murphy, Steele, & Gross, 2007), institutes and organizations can implement interventions aimed at providing reminders for females. For instance, reminding them of an identity (i.e., college student) that is not in perceived conflict with their gender identity to allow female professionals with lower levels of G-PII to deal with the aversive effects of stereotype threat. Alternatively, since the findings of this paper showed that females with lower-levels of G-PII perform better with gender-related cues, it is likely that they may benefit from reminders aimed at making their gender identity salient rather than reminders that focuses on their professional identity. This form of tailored approach allows education institutes and organizations to cater to different individuals (low and high G-PIIs) and harness the correct environments (types of identity cues) in order for them to pursue degrees and careers in STEM fields successfully. Although it is difficult to change or eliminate the negative gender stereotype before long, my research will be able to inform education institutes and organizations on how they can provide psychological resilience to females as they progress through their careers in STEM fields.

Future Directions

My research focused solely on the benefit priming a favourable identity during stereotype threat brings to math performance of females, but more research is needed to explore the impact of using a favourable identity on other psychological variables. Von

Hippel, Walsh, and Zouroudis (2011) found that female leaders switch between their identities to cope with stereotype threat, but this coping strategy led to negative job attitudes and turnover intentions. Given that this paper solely focuses on the math performance of females, it is unclear if the reactance to different identity primes to deal with stereotype threat would led to aversive outcomes on their well-being and other psychological outcomes, such as satisfaction and job attitudes. Moreover, future research should examine how priming a favourable identity during stereotype threat affects other important variables known to influence females' performance under stereotype threat, such as anxiety (Mrazek, Chin, Schmader, Hartson, Smallwood, & Schooler, 2011; Gerstenberg, Imhoff, & Schmitt, 2012) , mind-wandering (Mrazek et al., 2011) and negative thinking (Cadinu, Maass, Rosabianca, & Kiesner, 2005). Priming a favourable identity may help decrease levels of anxiety, mind-wandering, and negative thinking during stereotype threat, which will help females in a subsequent performance task by redirecting attention to the task instead.

Additionally, future studies can examine the benefit of priming a favourable identity during stereotype threat on organizational performances where females are usually negatively stereotyped in, such as negotiations (Cheng & Tan, 2016) and managerial tasks (Bergeron, Block, & Echtenkamp, 2006). Bergeron, Block, and Echtenkamp (2006) found that the performance of females on a managerial in-basket task was compromised under stereotype threat. Priming their favourable identity (e.g., a manager) may help females with higher levels of G-PII improve on their work performance by shifting their focus to the favourable identity from their gender identity. Cheng and Tan (2016) also found that females with higher levels of G-PII displayed higher levels of cooperative tendency and are less likely to make counteroffers during a negotiation task when primed with gender primes. Hence, it is possible to counter this by reminding them of their business identity.

Future studies can also investigate if increasing the level of G-PII of females with lower levels of G-PII will lead to the same outcomes observed among females with higher levels of G-PII. Specifically, females with higher levels of G-PII will have better performance in the math test if their professional identity is primed during stereotype threat, Given that level of G-PII is malleable (Cheng & Lee, 2009; 2013), increasing the level of G-PII of females with lower levels of G-PII should lead to the same outcome, that is better math performance when their identity is primed.

Chapter 9. CONCLUSION

According to past research, the priming of a favourable identity aided females in stereotype threat. Specifically, the salience of a favourable identity allowed females to identify with this identity, freeing up and redirecting cognitive resources to a subsequent performance task. However, if the individual difference of G-PII is taken into account, females' math performance suffered more when primed with an advantageous identity that is in perceived conflict with their gender identity. In fact, females with lower levels of G-PII exhibit worse math performance than when just primed with their gender identity alone. The salience of an advantageous identity that was in perceived conflict with their gender identity lead females with lower levels of G-PII might use more cognitive resources in processing the identity cues, depleting the amount of cognitive resources that could have been used on a subsequent performance task. The findings have implications for understanding situations where females with higher levels of G-PII and females with lower levels of G-PII perform differently especially when dealing with gender stereotype threats.

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APPENDIX

Appendix 1

G-PII Scale (adapted from Benet-Martínez, 2003; Huynh, 2009)

Instructions: Please indicate the extent to which you agree with the statements below about yourself as a female businessperson (i.e., woman with a business degree/major and/or aspires to work in a business environment). Please respond to these statements as to how you feel at this moment. There are no right or wrong answers. Please be open and honest in your responses.

1 (Strongly disagree), 7 (Strongly agree)

1. I feel that there are more similarities than differences between my gender and business identities.
2. Both my gender and business identities make me who I am.
3. I cannot ignore the gender or business side of me.
4. I feel like a female and a businessperson at the same time.
5. I relate better to a combined gender-business identity than to a gender or a business identity alone.
6. I feel "female-businessperson" (hyphenated, a mixture of the two).
7. I feel part of a combined gender-business identity.
8. I find it difficult to combine my gender and business identities.
9. I do not blend my gender and business identities.
10. Being a female businessperson is like being divided into two parts.
11. I have a foot in each identity, both gender and business identities.
12. I am simply a female in a business workplace.
13. I keep my gender and business identities separate.
14. I find it easy to harmonize my gender and business identities.
15. I do not find being a female businessperson difficult.
16. I find it easy to have both gender and business identities.
17. I rarely feel conflicted about being a female businessperson.
18. I find it easy to balance both my gender and business identities.
19. I feel that my gender and business identities are complementary.
20. I do not feel trapped between my gender and business identities.
21. I feel torn between my gender and business identities.
22. When I am in a situation that makes my gender identity salient, I cannot relate to my business identity at the same time.
23. It takes a lot of effort to be a female and a businessperson at the same time.
24. Being a female businessperson means having two forces pulling on me at the same time.
25. I feel that my gender and business identities are incompatible.
26. When I am in a business-related situation, I cannot relate to my gender identity at the same time.
27. It is a challenge to be a female and businessperson at the same time.
28. I feel pulled by the gender and business cultural forces in my life.
29. I find it difficult to hold both my gender and professional identities.
30. I am conflicted between the female and business ways of doing things.
31. I feel like someone moving between my gender and business identities.
32. I feel caught between my gender and business identities.

Appendix 2

GRE Mathematics Questions

Question 1.
It is given that *x* is a positive integer and *y* is a negative integer.
Quantity A: *x* minus *y*
Quantity B: *y* minus *x*
A. Quantity A is greater.
B. Quantity B is greater.
C. The two quantities are equal.
D. The relationship cannot be determined from the information given.

From the answer choices given, select and indicate the one that describes the relationship between quantity A and quantity B.

Question 2.
It is given that *a* and *b* are positive integers.
Quantity A: The fraction *a* over *b*
Quantity B: The fraction with numerator $a + 3$. and denominator $b + 3$
A. Quantity A is greater.
B. Quantity B is greater.
C. The two quantities are equal.
D. The relationship cannot be determined from the information given.

From the answer choices given, select and indicate the **one** that describes the relationship between quantity A and quantity B.

Question 3.
The original price of a suit was 30 percent less than the suit's $250 suggested retail price. The price at which the suit was sold was 20 percent less than the original price.
Quantity A: The price at which the suit was sold
Quantity B: 50% of the suit's suggested retail price
A. Quantity A is greater.
B. Quantity B is greater.
C. The two quantities are equal.
D. The relationship cannot be determined from the information given.

From the answer choices given, select and indicate the one that describes the relationship between quantity A and quantity B.

Question 4.
Refer to the figure.

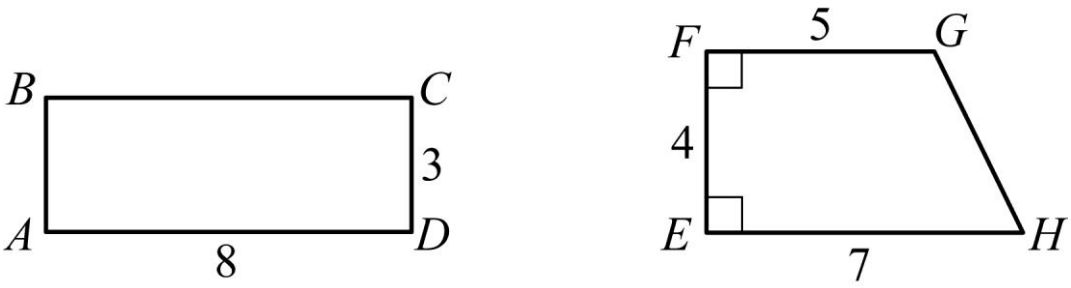

Figure for Question 9

The figure accompanying this question consists of rectangle *ABCD* and trapezoid *EFGH*. In rectangle *ABCD*, the length of horizontal side *AD* is 8 and the length of vertical side *CD* is 3. In trapezoid *EFGH*, the leftmost side, *E F*, is a vertical line segment with endpoint *F* lying above endpoint *E*. Side *E F* meets the two horizontal sides, *FG* and *E H*, at right angles. The length of horizontal side *FG* is 5 and the length of horizontal side *E H* is 7. The length of vertical side *E F* is 4 and the length of side *GH* is not given.

Quantity A: The area of rectangular region *ABCD*
Quantity B: The area of trapezoidal region *EFGH*
A. Quantity A is greater.
B. Quantity B is greater.
C. The two quantities are equal.
D. The relationship cannot be determined from the information given.

From the answer choices given, select and indicate the <u>one</u> that describes the relationship between quantity A and quantity B.

Question 5.
This question has five answer choices, labeled A through E. Select the best **<u>one</u>** of the answer choices given.
If *j* and *k* are integers and *j* minus *k* is even, which of the following must be even?
A. *k*
B. *jk*
C. *j* + 2*k*
D. *jk* + *j*
E. *jk* minus 2*j*

Select and indicate the best **<u>one</u>** of the answer choices given.

Question 6.
This question has five answer choices, labeled A through E. Select **<u>all</u>** the answer choices that apply.
Last year Kate spent between one fourth and one third of her gross income on her mortgage payments. If Kate spent $13,470 on her mortgage payments last year, which of the following could have been her gross income last year?

Indicate **all** such gross incomes.
A. $40,200
B. $43,350
C. $47,256
D. $51,996
E. $53,808

Select and indicate **all** the answer choices that apply. The correct answer to a question of this type could consist of as few as one, or as many as all five of the answer choices.

Question 7.
This question has five answer choices, labeled A through E. Select the best **one** of the answer choices given.

Refer to the figure.

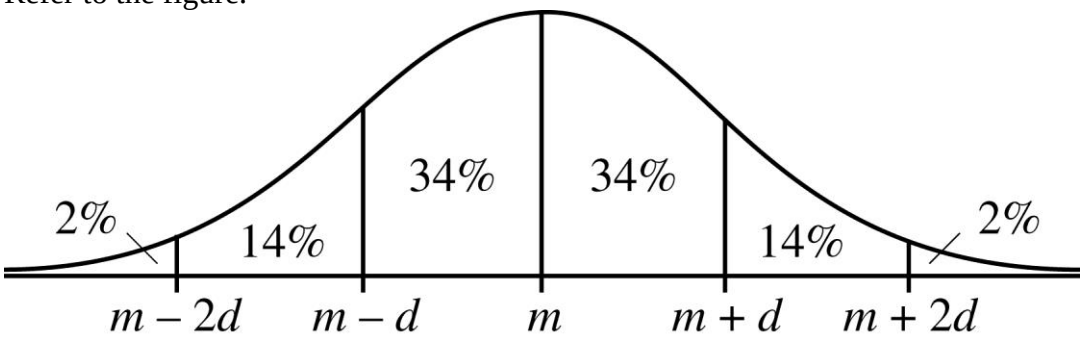

Figure for Question 16

The figure accompanying this question consists of a graph of a normal distribution with mean *m* and standard deviation *d*. The graph shows a bell-shaped curve drawn above a horizontal axis. On the horizontal axis, from left to right, are the 5 equally spaced numbers; *m* minus 2*d*, *m* minus *d*, *m*, *m* + *d*, and *m* + 2*d*. Vertical line segments above each of these numbers divide the normal distribution into 6 regions. The approximate percents of the distribution in each of the six regions are given as follows. To the left of the number *m* minus 2*d*: 2%; between the number *m* minus 2*d* and the number *m* minus *d*: 14%; between the number *m* minus *d* and the number *m*: 34%; between the number *m* and the number *m* + *d*: 34%; between the number *m* + *d* and the number *m* + 2*d*: 14%; and to the right of the number *m* + 2*d*: 2%.

The figure shows a normal distribution with mean *m* and standard deviation *d*, including approximate percents of the distribution in each of the six regions shown.
For a population of 800,000 subway riders, the numbers of subway trips taken per rider last January are approximately normally distributed with a mean of 56 trips and a standard deviation of 13 trips. Approximately how many of the riders took between 30 and 43 trips last January?
A. 60,000
B. 110,000
C. 160,000
D. 210,000
E. 270,000

Select and indicate the best **one** of the answer choices given.

Question 8.
This question has five answer choices, labeled A through E. Select the best **one** of the answer choices given.

The quantities *S* and *T* are positive and are related by the equation $S = \frac{k}{T}$, *S* equals the fraction *k* over *T*, where *k* is a constant. If the value of *S* increases by 50 percent, then the value of *T* decreases by what percent?

A. 25%
B. $33\frac{1}{3}\%$ 33 and 1 third percent
C. 50%
D. $66\frac{2}{3}\%$ 66 and 2 thirds percent
E. 75%

Select and indicate the best **one** of the answer choices given.

Question 9.
This question has five answer choices, labeled A through E. Select the best **one** of the answer choices given.

If *x* and *y* are the tens digit and the units digit, respectively, of the product $725,278 \times 67,066,$ 725,278 times 67,066 what is the value of *x* + *y* ?

A. 12
B. 10
C. 8
D. 6
E. 4

Select and indicate the best **one** of the answer choices given.

Question 10.
This question has five answer choices, labeled A through E. Select the best **one** of the answer choices given.

A developer has land that has *x* feet of lake frontage. The land is to be subdivided into lots, each of which is to have either 80 feet or 100 feet of lake frontage. If 1 ninth of the lots are to have 80 feet of frontage each and the remaining 40 lots are to have 100 feet of frontage each, what is the value of *x* ?

A. 400
B. 3,200
C. 3,700
D. 4,400
E. 4,760

Select and indicate the best **one** of the answer choices given.

Appendix 4

Instructions: An anagram is a scrambled set of letters that can be rearranged to make a word.

E.g.: TPIOA can be unscrambled to make the word PATIO

You will be required to solve 10 anagrams in this task. You will be given a total of 7 minutes to do so. Once 7 minutes is up, the page will advance to the next task.

(Note. Some of the anagrams have no solution. For the rest, the correct answer is provided in brackets.)

TRELCIA: _____ (ARTICLE)

PPTORSU: _____ (SUPPORT)

SIONVIR: _____ (no solution)

RMAORGP: _____ (PROGRAM)

ROPLEML: _____ (no solution)

FTWSOAER: _____(SOFTWARE)

UALLACTY: _____(ACTUALLY)

THIWOTUW: _____(no solution)

TIESONQU: _____ (QUESTION)

ONEESOME: _____(no solution)

Appendix 5

Strength of Identities (adapted from Brown, Condor, Matthews, Wade, & Williams, 1986; Levine & Thompson, 2004)

Instructions: Please indicate how often these statements about your identities apply to you in general. There are no right or wrong answers. Please be open and honest in your responses.

1 (Never), 2 (Seldom), 3 (Sometimes), 4 (Often), 5 (Very often)

1. I am a person who considers being female important
2. I am a person who identifies with being female
3. I am a person who feels strong ties with other females
4. I am a person who is glad to belong to the female gender
5. I am a person who sees myself as belonging to the female gender
6. I am a person who makes excuses for belonging to the female gender
7. I am a person who tries to hide belonging to the female gender
8. I am a person who feels held back by being female
9. I am a person who is annoyed to say I'm a member of the female gender group
10. I am a person who criticizes the female gender group
11. I am a person who considers being a businessperson important
12. I am a person who identifies with being a businessperson
13. I am a person who feels strong ties with other businesspersons
14. I am a person who is glad to belong to the businesspersons profession
15. I am a person who sees myself as belonging to the businesspersons profession
16. I am a person who makes excuses for belonging to the businesspersons profession
17. I am a person who tries to hide belonging to the businesspersons profession
18. I am a person who feels held back by being a businessperson
19. I am a person who is annoyed to say I'm a member of the businesspersons profession group
20. I am a person who criticizes the businesspersons profession group

Appendix 6

Domain Identification Measure (Smith et al., 2005)

Instructions: Using the following scale, please indicate the number that best describes how much you agree with each of the statements below.

1 (Strongly disagree), 2 (Moderately disagree), 3 (Neither Disagree or Agree), 4 (Moderately Agree), 5 (Strongly Agree)

1. Math is one of my best subjects.
2. I have always done well in math.
3. I get good grades in math.
4. I do badly in tests of math (R)

Please indicate the number that best describes you for each of the statements below using the following scale:

1 (Not at all), 2, 3 (Somewhat), 4, 5 (Very much)
5. How much do you enjoy math-related subjects?
6. How likely would you be to take a job in a math related field?
7. How much is Math to the sense of who you are?
8. How important is it to you to be good at Math?M

9. Compared to other students, how good are you at math?M
1. Very poor
2. Poor
3. About the same
4. Better than average
5. Excellent

Note. “R” indicates reverse-coded items