INTERPERSONAL TRIGGERS AND CULTURAL MODERATORS OF SOCIAL IDENTITY THREAT

by

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Abstract

Social identity threat has most often been examined as impairing academic achievement among female and minority students. But for those who successfully advance into graduate school and professional settings, social identity threat might continue to be triggered by ambiguously negative interactions with others. My goal was to investigate the experience of social identity threat among samples of professionals in the workplace and students training in STEM programs with the aim of identifying triggers of threat, contextual and interpersonal buffers against threat, and cognitive consequences. To do this I conducted a series of studies in which I explored two research questions: 1) What are the antecedents and consequences of social identity threat in STEM workplace conversations? 2) Do gender inclusive policies and/or a higher representation of women in a workplace reduce the experience of social identity threat in workplace conversations? I used a series of daily diary studies and an experiment to answer these questions.

To test whether interpersonal experiences in STEM workplaces and graduate programs are a source of social identity threat for women, participants reported their interactions with colleagues using daily dairies over the course of two weeks. Across three samples, results of multilevel modeling revealed that: 1) women (but not men) reported greater daily experiences of social identity threat on days when their conversations with men (but not women) cued a lack of acceptance, and 2) these daily fluctuations of social identity threat predicted feelings of mental burnout, consistent with a capacity deficit model of social identity threat.

The two workplace samples, along with an experiment with undergraduate engineers, were used to examine whether gender inclusive workplace policies and practice and/or a higher representation of women in a workplace relate to improved cross-sex interactions and reduced
social identity threat for women in STEM settings. Results revealed that female engineers’ daily actual and anticipated experience of social identity threat was lower in companies perceived to have more gender inclusive policies, as mediated by more positive conversations with male colleagues. The implications for reducing social identity threat in naturalistic settings are discussed.
Preface

The research presented in this dissertation is the product of a collaboration between Dr Toni Schmader, Dr. Elizabeth Croft, and myself. Under the supervision of Dr. Schmader, I was responsible for the formulation of the research questions, design and implementation of surveys, statistical analyses of data, and composition of manuscripts. Dr. Croft facilitated data collection and provided feedback on manuscripts. All projects and associated methods were approved by the University of British Columbia’s Behavioral Research Ethics Board (certificates H11-02841 and H15-00090).

A portion of Chapter 2 has been published. Hall, W. M., Schmader, T., & Croft, E. (2015). Engineering Exchanges Daily Social Identity Threat Predicts Burnout Among Female Engineers. Social Psychological and Personality Science, 6(5), 528–534. For this paper, Dr. Schmader and I formulated the research question and designed the surveys, I collected the data and conducted all of the statistical analyses under the guidance of Dr. Schmader, and the manuscript was written by all three authors.
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List of Abbreviations

STEM = Science, Technology, Engineering, and Math.
IAT = Implicit Associations Test
BIAT = Brief Implicit Associations Test
SD = Standard Deviation
M = Mean
SIT = Social Identity Threat
HR = Human Resources
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Chapter 1: Introduction

“I once had a male senior engineer come into my office and tell me that I needed to find a place to work that was more friendly towards women…I was really struggling in this job and, at the time, believed that there was something wrong with me. To have someone I respected, a male in particular, tell me that the problem wasn’t with me, but with the corporate culture meant a lot.”

- Female Engineer (Study 1, Chapter 2)

When entering a workplace, you face the challenge of learning the norms, traditions, and language of that setting. Learning and adapting to a workplace culture is difficult on its own, but imagine having to do so when you belong to a group that is stereotyped to be inferior or devalued in that setting. This is the challenge that many women aiming to make a career in STEM (Science, Technology, Engineering, Math) face day-to-day. As the quote above suggests, the people and culture in a STEM workplace can represent a significant barrier to women succeeding in a job that they have spent much of their adult life preparing for.

Qualified women are failing to participate and stay in these careers. For example, in engineering, women make up only 10 – 13% of the professional workforce and 40% leave the job in the first 5 years (Hill, Corbett, & St. Rose, 2010; Hunt, 2010). Although efforts to encourage women to study STEM have resulted in gains in women’s participation in these fields in K-12 and college, little attention has been placed on aspects of the workplace that might retain women and help them excel. The focus of my dissertation will be to elucidate some of the social-psychological forces that constrain women’s participation and success in STEM workplaces. Specifically, I will examine the role of social identity threat, that is, the fear of being devalued in a particular context because of one’s group membership (C. M. Steele, Spencer, & Aronson,
2002), and how it may contribute to workplace burnout for women working in STEM settings. To do this, I will try to answer two questions: 1) When interacting with men, do women experience social identity threat which then contributes to workplace burnout? 2) Can cultural factors of a workplace buffer women against social identity threat?

Social identity threat has been defined as the concern people experience in contexts where their social group is underrepresented, stereotyped to be inferior, or otherwise devalued (C. M. Steele et al., 2002). A large body of research suggests that the mere awareness of negative stereotypes can subtly block women’s interest and advancement in STEM settings (Walton & Spencer, 2009). According to this framework, women in STEM face two broad psychological challenges. One is stereotype threat – a concern that they might inadvertently do something to confirm a negative stereotype about women or will be seen as lacking competence. The second is belongingness threat – a feeling that others in one’s community are not accepting of one’s presence and participation in the domain. As one of the most widely studied topics in social psychology over the last decade, social identity threat has been shown to undermine performance across a broad number of domains and for a variety of different groups (Spencer, Steele, & Quinn, 1999; C. M. Steele & Aronson, 1995), including organizationally relevant outcomes such as negotiation success (Kray, Leigh Thompson, & Galinsky, 2001; Kray & Shirako, 2012). Essential to the theory is the notion that situations themselves can subtly or explicitly cue one’s devalued status in a domain, leading to negative cognitive, affective, and performance-based consequences (Schmader, Johns, & Forbes, 2008).

Meta-analyses of the literature reveal the performance impairing effects of social identity threat to be moderate in effect size and are hypothesized to contribute to racial and gender gaps in academic performance (Nguyen & Ryan, 2008; Walton & Spencer, 2009). Numerous studies
have now shown that a woman taking a quantitative test can experience an extra cognitive load when cued with the possibility that her performance could be judged on the basis of a negative stereotype about women’s inferior quantitative abilities, and somewhat ironically, the resulting impaired performance can seem to confirm the very stereotype she was motivated to disprove.

In addition to impairing performance, repeated experiences of social identity threat are thought to motivate psychological disengagement and behavioral avoidance from stereotyped domains (Davies, Spencer, & Steele, 2005; Major, Spencer, Schmader, Wolfe, & Crocker, 1998; J. R. Steele & Ambady, 2006). In a survey of undergraduate students across a range of academic disciplines, J. Steele and colleagues found that women majoring in science reported experiencing more gender discrimination and more social identity threat compared to students from the humanities; they were also more likely to consider changing their majors (J. Steele, James, & Barnett, 2002). In one of the few studies of professional women, subjective reports of social identity threat predicted women’s lower expectations for advancement, less job satisfaction, and greater intentions to quit (von Hippel, Issa, Ma, & Stokes, 2011).

In sum, there is now a large body of research pointing to how negative stereotypes can subtly derail women and minority group’s success in academic settings. However, the vast majority of these studies focus on student populations and address problems in the pipeline of promoting women’s entry into STEM, for example, by undermining test performance. Very little research has examined the naturalistic experience of social identity threat among professional women working in STEM fields, and no studies have clearly identified naturally occurring environmental cues (as distinct from individual biases) that trigger or reduce social identity threat. On the one hand, the proven track record of professional STEM women might suggest that they have been inoculated against the experience of social identity threat and would thus be
rather insensitive to its effects. Alternatively, theory suggests that those who are most invested in doing well in a domain should be most threatened by the implied inability suggested by negative stereotypes (Steele et al., 2002).

Given the dearth of research on social identity threat among non-student samples, my goal was to investigate the experience of social identity threat among samples of professionals in the workplace and students training in STEM programs with the aim of identifying triggers of threat, contextual and interpersonal buffers against threat, and cognitive consequences. To do this I have conducted a series of studies in which I explored two research questions: 1) What are the antecedents and consequences of social identity threat in STEM workplace conversations? 2) Do gender inclusive policies and/or a higher representation of women in a workplace reduce the experience of social identity threat in workplace conversations? Answering these questions has the potential to inform why there are higher rates of attrition among women in STEM compared to other professions (Hunt, 2010).

1.1 Social Identity Threat in Workplace Conversations

The workplace is a key part of most adult lives. It is where we spend a great deal of our time (Wronski, 2014), form a large percentage of our non-kin relationships (Marks, 1994), is a contributor to our well-being and sense of meaning (Csikszentmihalyi, 2014), and is a source of financial security. Thus, maximizing the success a person experiences at work can have both psychological and fiscal payoffs. As women enter into STEM careers in greater numbers (Hill et al., 2010), it is critical to examine factors that maximize the human potential that they bring to these domains. As workplaces become increasingly heterogeneous, perspectives become more diverse and this diversity has benefits for a company’s success (Apfelbaum, Phillips, & Richeson, 2014). However, diverse workplaces also suffer from higher levels of negative
interpersonal experiences (e.g. DiTomaso, Post, & Parks-Yancy, 2007; Herring, 2009; Jackson, Joshi, & Erhardt, 2003; King, Hebl, & Beal, 2009; Mannix & Neale, 2005; Van Knippenberg & Schippers, 2007). Thus, to fully benefit from women’s increased participation in STEM, we must create workplaces where people can successfully cooperate, share, and synthesize knowledge (Apfelbaum et al., 2014; Gersick, Dutton, & Bartunek, 2000). Doing so will allow people to have more professional success and personal well-being, along with increased financial prosperity at the company level (Grant, 2013; N. P. Podsakoff, Whiting, Podsakoff, & Blume, 2009; P. M. Podsakoff, MacKenzie, Paine, & Bachrach, 2000).

The first step in understanding how social identity threat might constrain women’s success in STEM workplaces is pinpointing where it might be experienced. Social identity threat is most readily felt in evaluative contexts (C. M. Steele et al., 2002). Professional contexts, unlike academic domains, do not include formal tests of one’s abilities. However, STEM workplaces, in particular, are highly collaborative where teams work together to develop, design, implement, and troubleshoot projects. In this kind of collaborative environment, conversations with colleagues can be the daily encounters where one’s ideas and abilities are critically evaluated by others. This makes them ripe for the experience of social identity threat.

Workplace conversations that take place under the cloud of social identity threat could be detrimental to the people having these conversations. Our interpersonal interactions are crucial in establishing a number of important psychological needs. It is in conversations with others that we garner feelings of acceptance (Baumeister & Leary, 1995), establish competence (Baumeister, 1982; Cuddy, Fiske, & Glick, 2007, 2008; Fiske, Cuddy, Glick, & Xu, 2002), get a sense of well-being (Nezlek & Gable, 2001; Nezlek, Hampton, & Shean, 2000; Nezlek, Imbrie, & Shean, 1994), feel positive affect (Vittengl & Holt, 1998), feel understood (Deci & Ryan,
Specific to the workplace, meta-analyses have shown that people who report having positive workplace interactions have increased job success (De Dreu & Weingart, 2003). For instance, people who report having positive workplace interactions report less intention to leave their current job (Barling & Phillips, 1993; Dittrich & Carrell, 1979; Donovan, Drasgow, & Munson, 1998), take fewer sick days (Barling & Phillips, 1993; Dittrich & Carrell, 1979), and report lower levels of psychological distress (Cortina, Magley, Williams, & Langhout, 2001). Not only do people feel better when having more positive workplace interactions, they also change their behavior. In workplaces with high levels of positive interactions people engage in more prosocial behaviors (Bettencourt & Brown, 1997; Moorman & Blakely, 1995; Organ & Ryan, 1995; Smith, Organ, & Near, 1983) and information exchange (Nahapiet & Ghoshal, 1998). This helps with the formation of social support and mentor networks (Gould & Penley, 1984; Higgins, 2000; Higgins & Kram, 2001) that have been shown to predict job success (Eddleston, Baldridge, & Veiga, 2004; Forret & Dougherty, 2004; Lyness & Thompson, 2000). In sum, there is now a large body of research pointing to the importance of the conversations that take place at work.

What has not been studied is why, when, and with whom women might experience social identity threat in workplace conversations. Social categorization processes, whereby people interact with one another on the basis of a group identity rather than as individuals, are the precursors to social identity threat (Schmader et al., 2008; C. M. Steele et al., 2002; Tajfel & Turner, 1979). These process are also very common in conversations as people often draw upon relevant social categories in order to effectively navigate interactions (Goffman, 1959; Tajfel &
Thus, when women are engaging in conversations where social categorization processes prime gender and drive behavior, I believe that the likelihood of social identity threat is increased.

Although prior research has not thoroughly examined the more subtle experience of social identity threat in STEM professions, evidence does point to the existence of more explicit forms of gender bias born from social categorization processes (Berdahl & Raver, 2011).

Specifically, in workplace interactions with men, women experience significantly higher levels of harassment (Rospenda & Richman, 2004b), aggression (Neuman & Baron, 1996), bullying (Rayner & Hoel, 1997), incivility (Andersson & Pearson, 1999), emotional abuse (Keashly, Harvey, & Hunter, 1997), social undermining (Duffy, Ganster, & Pagon, 2002), sexism (Cortina, 2008), and sexual harassment (Berdahl & Raver, 2011). These harassing behaviors are distinct from social identity threat in that they are motivated by attempts to degrade women’s status in the workplace, but similar in that they are born from social categorization processes (Berdahl & Raver, 2011; C. M. Steele et al., 2002).

The categorization processes that underlie social identity threat result in a cocktail of affective, physiological, and cognitive processes that undermine performance in testing situations (Schmader, 2010). By extension, underperformance in interactions could be evidence that women are experiencing social identity threat in conversations. There is evidence that women sometimes perform less well than their male colleagues during workplace interactions. First, women often perform less well in cross-sex negotiations (Kray et al., 2001; Stuhlmacher & Walters, 1999; Walters, Stuhlmacher, & Meyer, 1998). For instance, in a meta-analysis of negotiation studies, men were found to consistently negotiate better than women. This gender difference has been shown to be partially explained by subtle cues to gender stereotypes that
might elicit social identity threat (Kray et al., 2001). Second, women tend to be less influential in conversations than men (Carli, 1999; Dasgupta, Scircle, & Hunsinger, 2015). When interacting with men, women engage in more tentative language and participate less (i.e. speak less often; Carli, 1990; Dasgupta, Scircle, & Hunsinger, 2015). Finally, women often reap fewer benefits from their workplace conversations. Women’s social networks are not only smaller (Ibarra & Andrews, 1993) but also less predictive of workplace success (Eddleston et al., 2004; Forret & Dougherty, 2004; Ibarra & Andrews, 1993; Lyness & Thompson, 2000).

The evidence reviewed up to this point shows that in workplace interactions, where gender is made salient, women often have worse outcomes than do men. Research aimed at understanding the cause of women’s underperformance in the workplace has more often focused on how men’s biased perceptions and behaviors undermine women in the workplace. Social identity threat, on the other hand, is born out of more subtle behaviors that in conversational contexts are often imperceptible. Three studies have examined the experience of social identity threat in cross-sex encounters within stereotyped domains. One series of lab experiments revealed that female engineering students performed more poorly on an engineering test after having to work together with a male peer who held implicit sexist beliefs (Logel et al., 2009). Follow-up experiments identified that a more dominant posture by a male partner was a specific cue that triggered women’s threat-based performance decrements, even though women themselves actually reported liking their dominant or sexist partners more than a laid-back, non-sexist partner.

In a more a naturalistic study, Holleran and colleagues (2011) sampled workplace conversations from male and female STEM faculty. Analysis of these conversational snippets revealed that for men, the more their conversations with their male colleagues were about
research topics, the more engaged they reported being with their work. For women, however, the more their conversations with male colleagues were about research, the more disengaged they were with their work. Further, only when talking about research with men were women later rated by coders as sounding less competent than were men discussing research with other men, even though men were not coded as having dominated their conversations with women. Interactions with female colleagues did not show the same pattern nor did conversations about non-work related issues. These findings are consistent with the work of C. von Hippel et al. (2011) demonstrating that professional women report greater social identity threat when they self-report comparing themselves to male (vs. female) colleagues.

This existing evidence suggests that women’s work-related conversations can cue underperformance and disengagement even in highly accomplished women. However, no prior study has: a) directly measured women’s concerns with being evaluated by others based on their gender, b) linked such concerns to specific types of conversational cues, and c) examined how daily fluctuation in these experiences predict within-person variability in psychological burnout and cognitive performance. The present research aims to elucidate the triggers and consequences of social identity threat in workplace settings. To do this, I will test a series of hypotheses all focused on women’s experience of workplace conversations in STEM.

First, I hypothesize that work conversations with men (but not with women) that cue a lack of acceptance and competence will trigger social identity threat for women, measured as a conscious awareness of being evaluated by others through the lens of gender. I expect that cross-sex conversations are where women will experience social identity threat because these conversations, especially when they elicit negative self-perceptions, have the potential to elicit the group-based categorization processes that underlie the phenomena (Schmader et al., 2008; C.
M. Steele et al., 2002). Women’s conversations with other women (even those that elicit negative self-perceptions) are less likely to engage group-based categorization processes and be interpreted as possibly confirming negative gender stereotypes.

Importantly, conversations with men should not indiscriminately trigger social identity threat for women. Because women experience social identity threat when they perceive that they are confirming a negative stereotype about their gender (Schmader et al., 2008; Spencer et al., 1999; C. M. Steele et al., 2002), cross-sex conversations that cue a sense of incompetence and lack of belonging (two key components of feeling social identity threat in performance-based settings Steele et al., 2002) will be a source of social identity threat for women. Put differently, cross-sex interactions that cue acceptance and competence should minimize women’s experiences of social identity threat, similar to other evidence that positive intergroup contact can inoculate against social identity threat (Abrams et al., 2008). I will also test other types of more explicitly harassing conversations as triggers of identity threat. Although these types of conversations can also trigger social identity threat for women (Dardenne, Dumont, & Bollier, 2007), it will be important to distinguish between conversations that are openly hostile from those that more subtly trigger a lack of acceptance.

Second, I will examine how the negative implicit and explicit biases held by men and women contribute to the experience of social identity threat during work conversations. Past research has shown that in conversations, negative stereotypic biases that are implicit predict subtle nonverbal behaviors that negatively affect interactions (Dovidio, Kawakami, & Gaertner, 2002; Logel et al., 2009). These subtle behaviors can trigger social identity threat (Logel et al., 2009) for women. I will test the hypothesis that men who implicitly associate the concept of STEM more with their concept of men than of women will be more likely to make women feel a
lack of acceptance and competence in cross-sex conversations and trigger social identity threat. Furthermore, men’s explicit associations of STEM with men might predict hostility in cross-sex conversations which could also trigger social identity threat for women.

I will also test how the biased associations held by women contribute to their own experience of social identity threat. Past research has shown that women who hold negative expectations or stereotypes are particularly likely to perceive bias and experience social identity threat (Brown & Pinel, 2003a; Forbes & Schmader, 2010; Inzlicht, Kaiser, & Major, 2008). For example, the degree to which women expect to be the target of sexism and stereotyping (i.e., are high in stigma consciousness) predicts a greater likelihood of perceiving bias in men’s behavior and experiencing social identity threat (Brown & Pinel, 2003b; Inzlicht et al., 2008; Townsend, Major, Gangi, & Mendes, 2011). In conversations, higher levels of stigma consciousness could make women particularly likely to see bias in men’s behavior that creates concerns about being targeted by a negative stereotype.

Other work has shown that women who are cued to hold implicit associations linking men to STEM are more susceptible to experiencing social identity threat (Forbes & Schmader, 2010). For example, in performance contexts, women who hold negative implicit stereotypes about women in STEM underperform on a quantitative test to a greater degree than women with more positive stereotypes (Forbes & Schmader, 2010; Nosek, Banaji, & Greenwald, 2002b). During conversations, women with more negative stereotypes might have lower thresholds for interpreting negative cues as evidence of bias which should trigger heightened social identity threat (Strack & Deutsch, 2004). Thus, in the present work, I will examine how both women’s expectation of prejudice (i.e., stigma consciousness) and associations linking STEM to men (implicit bias) contribute to perceiving social identity threat when interacting with male
colleagues. I hypothesize that women who either expect to experience bias or hold negative implicit stereotypes about women in STEM might experience higher levels of social identity threat when having negative conversations with male colleagues.

Finally, drawing from past theory (Schmader et al., 2008; C. M. Steele et al., 2002), I hypothesize that daily experiences of social identity threat will correlate with daily self-reported burnout and working memory capacity. This hypothesis is consistent with other experimental evidence showing that social identity threat impairs working memory capacity (Schmader et al., 2008) and promotes ego-depletion (Inzlicht, Tullett, Legault, & Kang, 2011). Psychological burnout is known to impede workplace productivity and predict workplace burnout (Maslach, Schaufeli, & Leiter, 2001). Linking the experience of social identity threat with day-to-day reports of workplace burnout and working memory will be an important step in understanding the antecedents of the high attrition rates of women from STEM workplace.

Hypotheses regarding the experience of social identity threat in workplace conversations will be examined in Chapter 2 of my dissertation using samples of professional engineers and STEM graduate students.

1.2 Cultural Buffers Against Social Identity Threat in the Workplace

In addition to assessing whether women experience social identity threat in their daily interactions with colleagues, a second key goal of this line of research is to examine how broader contextual factors in a workplace might buffer women from these effects. Researchers have begun to identify organizational policies and practices that can limit discriminatory behaviors and decision making (Kalev, Dobbin, & Kelly, 2006). Anti-discrimination practices, such as affirmative action and the formalization of hiring practices can help in increasing employment opportunities for women and minorities. However, there has been little work examining how
these types of initiatives impact employee relationships and interactions (Green & Kalev, 2009). More importantly, whereas a large body of research has shown that contextual factors in academic settings can reduce social identity threat (Murphy & Taylor, 2012), no empirical work has looked at whether factors in a workplace that cue an ‘identity safe’ setting can also reduce identity threat. In the present work, I sought to examine whether cues to a gender inclusive workplace culture could reduce social identity threat.

I will consider two contextual factors and examine whether they can reduce social identity threat for women in STEM: 1) gender inclusive workplace policies and, 2) the percentage of women employed in a workplace. These two factors were chosen because they have been shown to reduce identity threat in academic contexts (Inzlicht & Ben-Zeev, 2000; Murphy & Taylor, 2012) and are commonly used in workplace settings in an effort to reduce prejudice and stereotyping (Green & Kalev, 2009; Kalev et al., 2006). Furthermore, both have been hypothesized to impact quality of workplace interactions and relationships (Green & Kalev, 2009), which was the mechanism by which I believed they would reduce social identity threat.

Diversity polices and changes to hiring practices are effective in increasing the employment and job successes of women (Kalev et al., 2006). Hiring practices designed to recruit more women do just that (Kalev et al., 2006). With more women in an organization, you see more positive workplace interactions and more group cohesiveness (Hoffman & Maier, 1961; Kochan et al., 2003; Wood, 1987). Furthermore, the presence of women in the workplace help other women perform better (Dasgupta et al., 2015; Inzlicht & Ben-Zeev, 2000) and reduce negative stereotypes about women (Miller, Eagly, & Linn, 2014). Workplaces with policies designed to increase manager accountability and encourage collaboration tend to have more successful female employees who enjoy better relationship with their colleagues (Green &
Kalev, 2009; Smith-Doerr, 2004; Whittington & Smith-Doerr, 2008). For instance, female scientists perform better in companies that have policies to ensure that men and women occupy equal status roles (Whittington & Smith-Doerr, 2008). Thus, maybe not surprisingly, women do better in workplaces that implement structural changes that support their success.

I will investigate the degree to which subjective perceptions of a workplace (i.e., perceived representation of women and gender inclusive policies) and the objective reality of a workplace (i.e., the number of women and gender inclusive policies) predict lower social identity threat for women (and for men). Theorizing from models of social identity threat (G. L. Cohen & Garcia, 2008; Schmader et al., 2008) and stereotype formation (Gawronski & Bodenhausen, 2006, 2011), I propose that both perceived and objective organizational gender inclusive cues have the potential to reduce social identity threat.

Consider for a moment an employee who believes they work in an office that employs a larger number of women and has more gender inclusive workplace policies than is objectively true. I propose that perceptions of a workplace as supportive of women could shape employees’ expectancies in ways that guide their attention and behavior (Klein & Kunda, 1992; Laurin, Fitzsimons, & Kay, 2011) and in doing so, buffer women against social identity threat. For women, these expectancies will shape the information they attend to during an interaction (C. E. Cohen, 1981). For instance, a woman who perceives that they work in a gender inclusive office might be less vigilant towards biased behavior (Inzlicht et al., 2008; Kaiser, Vick, & Major, 2006) and more attentive towards cues that disconfirm the potential for bias (G. L. Cohen & Garcia, 2008).

For men, these same expectancies could shape their own behavior during interactions with women. For example, men working in what they believe to be a gender inclusive workplace
will be motivated to avoid gender biases (Devine, Forscher, Austin, & Cox, 2012; Kalinoski et al., 2013; Klonis, Plant, & Devine, 2005; Plant & Devine, 2009) that seem inconsistent with what they perceive to be valued in the workplace (Rokeach, 1973). Thus, I predict that the perceived presence of women and/or gender inclusive policies could help lessen women’s day-to-day experience of social identity threat.

The number of women and gender inclusive workplace policies that are actually present in an organization could also predict social identity threat. Here I propose that the presence of women and/or gender inclusive policies may act as informational cues that help reduce social identity threat for female employees (G. L. Cohen & Garcia, 2008; Inzlicht & Ben-Zeev, 2000; Murphy, Steele, & Gross, 2007). Objective cues in a setting have been shown to directly reduce women’s experience of social identity threat in STEM contexts. For example, in STEM settings, women perform better when in groups that have a majority of women (Dasgupta et al., 2015; Inzlicht & Ben-Zeev, 2000). Other work has shown that exposure to stereotype inconsistent information can reduce negative stereotypes (Hewstone, 1989; Lai et al., 2014). This might be especially true for the types of implicitly biased associations (Dasgupta & Greenwald, 2001; Lai et al., 2014) that drive subtle behaviours from men that can trigger social identity threat (Dovidio et al., 2002; Logel et al., 2009) and make women susceptible to experiencing social identity threat (Forbes & Schmader, 2010). Thus, I expect that in workplaces with a large number of women and/or gender inclusive policies, women will experience less day-to-day social identity threat.

In the present research, I sought to examine both gender inclusive policies and female representation as two separate organizational features that might reduce women’s experience of social identity threat. For both, I will test the degree to which perceptions of a workplace (i.e.,
perceived representation of women and gender inclusive policies) and the objective reality of a workplace (i.e., the number of women and gender inclusive policies as reported by the human resource department) contribute to reducing the experience of social identity threat. Like research on organizational justice that has tested whether actual or perceived fairness is more important for perceptions of justice (Bobocel & Holmvall, 2001; Lind & Tyler, 1988), I will examine a similar question for social identity threat. Although research on organizational justice consistently shows that perceived procedural justice is actually much more important for predicting overall perceptions of fairness (Lind & Tyler, 1988), I believe that perceptions or reality could both plausibly mitigate social identity threat.

Assuming either workplace feature predicts less social identity, I also sought to test hypotheses about why this relationship exists. First, either variable could act as a direct cue that the environment is threat free, directly altering women’s perceptions of the workplace regardless of their interactions with colleagues (G. L. Cohen & Garcia, 2008; Purdie-Vaughns, Steele, Davies, Ditlmann, & Crosby, 2008). In other words, the positive cultural context could promote a less gender-based interpretation (i.e. lower levels of social identity threat) of ambiguously negative encounters.

Alternatively, cultural cues such as policies or prevalence of women in the organization could reduce threat by more indirectly by fostering more positive conversational norms in the organization that then predict lower social identity threat for women in particular (Brown & Pinel, 2003b; Dovidio et al., 2002; Forbes & Schmader, 2010; Logel et al., 2009; Yoshida, Peach, Zanna, & Spencer, 2012). Thus, by hiring more women and/or by setting gender inclusive policies, companies can promote a cultural mindset that creates mutually positive cross-sex
workplace conversations where employees are not in fear of being judged on the basis of a negative stereotype.

Even if gender inclusive policies and/or a higher representation of women in STEM workplaces predicts more positive outcomes for women, it is important to also examine the effect of these same contextual cues of inclusion for male colleagues. The first possibility, one that I have already discussed, is that a workplace that is supportive of women will yield more positive gender stereotypes about women in STEM and better cross-sex interactions (for men and women). This hypothesis is consistent with other work theorizing that cultural diversity can benefit both majority and minority group members (Apfelbaum et al., 2014; Crisp & Turner, 2011).

However, there is also reason to expect that a workplace that stresses gender inclusivity could lead men to have less positive interactions with women. For instance, when majority group members perceive an organization as fair or think intergroup relationships are positive, they are also less supportive of initiatives designed to further enhance the status of a disadvantaged group (Kay & Friesen, 2011; Wright & Baray, 2012). Furthermore, practices designed to increase workplace diversity can lead to reactance and resentment among members of the majority group (Morrison, Plaut, & Ybarra, 2010; Thomas & Plaut, 2008). This can happen when diversity programs are poorly implemented and lead to increased identity salience and intergroup conflict (Fiol, Pratt, & O’Connor, 2009; Paluck, 2006). Both of these could make men less motivated to change or control negative biases they may hold towards women in STEM and lead to more conflict during conversations. Thus, it is possible that a workplace that is, or is perceived to be, more gender inclusive by men could create an environment where they perceive their cross-sex interactions to be more negative.
A third possibility, is that like many other interventions that reduce social identity threat, inclusive policies and patterns of representation might benefit women but have relatively little predictive effect on men, who given their majority standing, have less reason to be vigilant to gender-based cues in the environment. This is typically what has been found in lab studies that manipulate contextual factors such as female representation in a STEM academic setting (e.g. Dasgupta et al., 2015; Murphy et al., 2007)

Hypotheses regarding whether culture cues in workplaces can reduce social identity threat will be examined in Chapter 3 of my dissertation using samples of professional engineers and STEM graduate students.
Chapter 2: Causes and Consequences of Social Identity Threat

2.1 Chapter Overview

In Chapter 2 of my dissertation, I outline the methods and results for a series of studies that aim to establish the causes and consequences of social identity threat for women in STEM workplaces. Three distinct samples that pertain to this common goal will be described. These samples will also be used in chapter three of my dissertation to answer different research questions, but more detail will be given in this chapter to describe the sample and the procedures.

My first research question asks whether STEM workplace conversations with male colleagues cue social identity threat for women. This question will be examined in a series of daily diary studies in STEM workplaces. The goal of these studies is to elucidate the triggers and consequences of social identity for women in these settings. Specifically, these studies are designed to answer the following questions: (1) Do work conversations with men that cue a lack of acceptance and competence trigger identity threat for women?, (2) Do daily fluctuations in social identity threat predict burnout among women more than men?, and (3) Are women’s daily experiences of social identity threat exacerbated by the negative biases held by women themselves or by their male conversation partners?

2.1.1 Overview of Samples and Study Designs

Data from three daily diary studies will be used to test the hypotheses outlined above. From here on, I will refer to the first daily dairy study as “The Healthy Workplace Study”, the second as “Engendering Engineering Success.”, and the third as “The Graduate School Study.” The samples differ across the three studies. The Healthy Workplace Study and Engendering Engineering Success are made up of professional engineers working in engineering companies.
across Canada, and The Graduate School Study is a sample of STEM graduate students from across North America.

Each daily diary study follows a similar methodology: Participants completed twelve online surveys. These included ten daily diary surveys done over the course of two work weeks, as well as a longer survey at both the start and end of the two week period. The daily diary surveys are used to measure within-person variation in the following: positivity of workplace conversations, the experience of social identity threat, psychological burnout, and working memory. The two longer survey measures, among other things, include individual differences in bias that have been shown to moderate the experience of social identity threat (Brown & Pinel, 2003b; Forbes & Schmader, 2010). Two types of bias measures will be assessed: 1) the propensity to see bias in others’ behavior (stigma consciousness; Pinel, 1999) and 2), the implicit and explicit association between men and engineering (Implicit Associations Test (IAT)). For the most part, the same measures will be used across the three studies. Places of divergence between studies will be noted in the description of the measures. Unless otherwise stated, participants responded to all self-report items using a 7-point scale (1 – Strongly disagree; 7 – Strongly agree). Below I describe the measures relevant to the present research questions; a complete list of measures used in this research can be found in Appendices A.1 (Study 1), B.1 (Study 2), and C.1 (Study 3).

2.2 Methods

2.2.1 Study 1

2.2.1.1 Sample and Recruitment

Data for study 1 came from The Healthy Workplace Study. Participants from a variety of engineering firms were recruited via email advertisements sent out on company and professional
listserves. Participants were eligible to complete the study if they indicated that they were trained as an engineer, spent most of their workday in a company office, and were employed full time. Two-hundred and ninety-one participants (129 women, 162 men) completed the initial screening survey. All eligible women \((n = 112)\) were invited to participate in the study. For each woman who agreed to participate, the research team then contacted a male participant who was matched on age, level of education, and ethnicity. Recruitment continued until at least 50 male and 50 female engineers enrolled in the study. This target was established to balance attaining a sample size sufficient for data analysis against the constraints placed on data collection of this unique and difficult to recruit sample (i.e., the scarce supply of female engineers).

One hundred and twenty-one participants (58 women, 62 men) completed the first survey. The final study sample of 96 engineers (52 female, 44 male) included only those participants who had data on all relevant between subject study variables, as well as a sufficient number of conversations across the diary period to estimate effects. The attrition rate from the first to last survey was 21\%, with men (29\%) being significantly more likely to drop out than women (11\%), \(X(1)^2 = 6.54, p = .011\). The 25 participants who did not complete measures beyond the first survey did not significantly differ on any of the first survey measures from the 96 participants that completed all relevant survey data.

The final sample came from 51 different engineering companies across Canada, were mostly White (77 White, 8 Chinese, 4 South Asian, 2 Aboriginal, 1 Black, 1 West Asian, 1 Chinese/Latin American, 1 White/Japanese, 1 Chinese/Southeast Asian) and the average age was 33.5 years old (there were no gender differences on participant age). Participants were compensated with a $10 gift card and entry into a prize draw for a Kindle Fire.
2.2.1.2 Daily Measures

2.2.1.2.1 Conversational Measures

In each daily diary survey, participants complete a modified version of the Rochester Interaction Record (Wheeler & Nezlek, 1977). Participants are asked to recall the three most significant face to face conversations they had while at work that day and identify the topic of conversation (work, social, or both), as well as the gender of, and their own relative status to (1 = much lower status, 7 = much higher status) their conversation partner. Drawing from prior research (Holleran et al., 2011), we focused our analyses on work conversations. Participants completed an average of 7.72 daily surveys across the ten days ($SD = 2.33$, range 1-9) and provided an average of 1.51 work conversations per day.

Participants rated how positively they felt during the conversation on a series of nine semantic differential items (e.g. 1 – Relaxed; 7 – Anxious; see Appendix A.2). Items were originally created to assess separate feelings of perceived competence (competent, free to exchange opinions and ideas, engaged, easy to follow, relaxed) and perceived acceptance (friendly, respected, accepted, authentic), a distinction that was confirmed with a factor analysis in a separate dataset of STEM graduate students (Hall & Schmader, unpublished data). However, in study 1, I found that these subscales were highly correlated with one another across the ten days ($r_s$ ranged between .60 - .82) and concluded that the resulting multi-collinearity between predictors might lead to unstable parameter estimates, thus I focused analyses on the average of all nine items to represent the positivity of thoughts elicited for each conversation.

Mean daily positivity scores for work conversations by gender of conversation partner were calculated by collapsing across the number of work conversations that participants reported each day. Thus, if participants reported one work conversation with a male colleague on a given
day, then the mean positivity score was computed from that single conversation. If two work conversations with male colleagues were provided, then the mean was computed by collapsing across those two conversations. This method was used to calculate positivity of work conversations with male and with female colleagues as separate variables for each day of the ten day diary period ($\alpha$s ranged from .84 - .94 across days)

Importantly, there were no gender differences in the number of conversations about work, the number of conversations with men, or the number of conversations with women, $p$s > .20. Not surprising in light of the underrepresentation of women in engineering, both men and women reported having more work conversations with male ($M_{men} = 16.50; M_{women} = 16.11$) than with female colleagues ($M_{men} = 6.19; M_{women} = 5.25$).

2.2.1.2.2 Daily Social Identity Threat

Each day, participants rated two items to assess daily social identity threat on a 7 pt. Likert scale (1 = “Strongly Disagree” to 7 = “Strongly Agree”): “Today at work, I felt very aware of my gender,” “Today at work, I was concerned that, because of my gender, my actions influenced the way other people interacted with me” ($r$s ranged from .70 - .92). These items were constructed by consulting past studies measuring the subjective experience of social identity threat (Cohen & Garcia, 2005; Shapiro & Neuberg, 2007).

2.2.1.2.3 Daily Burnout

Using the same 7 pt. scale, participants rated 12 items adapted from Demerouti and colleagues (2001) to measure daily burnout (e.g., “Today, I felt emotionally drained during work”; $\alpha$s ranged from 84 - .91; see Appendix A.3). This measure contains both mental exhaustion and disengagement subscales that I combined given the high covariation between subscales ($r$s = range from .47 to .72 across the 10 days).
2.2.1.3 Person Level Measures

2.2.1.3.1 Demographic Variables

Demographic variables included participant’s age, ethnicity, level of education, number of prior career positions, personal salary, gross salary, number of children, marital status, and job status (i.e., “What is your position/title” with five response options ranging from 1 = “Engineer in Training” to 5 = “Executive Director, and Senior Management”).

2.2.1.3.2 Expectation of Bias

Individual differences in stigma consciousness were assessed with the four items with highest factor loadings from the stigma-consciousness scale (α = .74; see Appendix A.4; (Pinel, 1999)). These items were modified to be specific to one’s gender (e.g., “When interacting with men/women, I feel like they interpret all my behaviors in terms of the fact that I am a woman/man”). To avoid creating demand characteristics in responding in the daily diary surveys, the measures of bias were completed in the survey that followed the daily diary component of the study. A limitation of this order is that a variable which will be treated as a predictor is measured after variables considered as outcomes. This shortcoming will be addressed in Studies 2 and 3.

2.2.2 Study 2

2.2.2.1 Sample and Recruitment

Data for Study 2 came from the Engendering Engineering Success Study. In this study, pairs of male and female professional engineers were recruited by company representatives at participating engineering firms. Companies were instructed to nominate pairs of male and female engineers who work together in small, mixed-sex groups or two of more people. Participants were eligible to complete the study if they indicated on an initial recruitment survey that they were trained as an engineer, spent most of their workday in a company office, and were
employed full time (as in the Healthy Workplace Study). As compensation, participants were allowed by their employer to complete the surveys during work hours, i.e. when their time is paid for by the company. Participants also received a $10 gift card if they completed the final survey.

Our original goal was to recruit 200 men and 200 women for the study to allow for a large enough sample after attrition (ideally, a sample double in size from the Healthy Workplace Study). Four hundred and six participants (208 women, 198 men) completed the initial screening survey, but as in study 1, the final sample included only those participants who had data on all relevant between-subjects study variables, as well as a sufficient number of conversations across the diary period to estimate effects. We also initially planned for a minimum number of 50 dyads to conduct dyadic analyses, but all eligible dyads (number of dyads = 191) were invited to participate in the study. These targets were established to balance attaining a sample size sufficient for dyadic data analysis against the constraints placed on data collection of this unique and difficult to recruit sample.

Of the 406 participants who completed the initial screening, 328 participants (172 women, 156 men) completed the first survey. The final study had a sample of 269 engineers (148 female; 121 male). The attrition rate from the first to last survey was 18%, with men (22%) being marginally more likely to drop out than women (14%), \(X(1)^2 = 3.43, p = .06\). The 59 participants who did not complete measures beyond the first survey did not significantly differ from the 269 participants who completed all relevant survey data. Note that not all of the data is dyadic; all primary analyses use the full sample (269 individual participants), and dyadic analyses will be constrained to the smaller sample (87 dyads).
The final sample came from 28 different engineering companies across Canada, were mostly White (172 White, 41 Chinese, 9 South Asian, 7 Latin American, 4 Arab/Middle Eastern, 4 Filipino, 2 Japanese, 2 South Asian, 1 Black, 1 Korean, and 26 participants selecting two or more of these ethnicities) and the average age was 35.10 years old. Female participants ($M=34.01$) were younger than male participants ($M=36.35$), $b = 2.35$, $p = .042$.

### 2.2.2.2 Daily Measures

#### 2.2.2.2.1 Conversational Measures

As in Study 1, participants completed a modified Rochester Interaction Record for 10 workdays and made ratings of their three most significant conversations for each day.

Three changes were made to these measures. First, to provide a shorter measure of positivity of conversations, participants made ratings using items only assessing feelings of perceived acceptance (friendly, respected, accepted, authentic, and relaxed, $\alpha$s ranged from .84-.93). I focused on feelings as acceptance as these items were found to be the most predictive of social identity threat in Study 1. Second, a limitation of Study 1 was that it did not include a measure of overt hostility. To address this limitation, I added two items that used semantic differentials to measure hostility: (1 = Polite, 7 = Condescending; 1 = Argumentative, 7 = Agreeable (reverse scored)); $rs$ ranged from .57-.79; see Appendix B.2 for the complete measure. Finally, because dyadic analyses require me to match conversations among pairs of participants in the sample, participants in this study were also asked to provide the initials of the person they were conversing with.

Participants completed an average of 7.69 daily surveys across the ten days ($SD = 1.64$, range 3-10) and provided an average of 2.00 work conversations per day. There were significant gender differences such that men reported having more conversation with male colleagues, $p =$
.028, and women reported having more conversations with female colleagues, \( p = .001 \), but no
gender differences in the number of conversations about work. Both men and women reported
having more work conversations with male (\( M_{\text{men}} = 10.96; M_{\text{women}} = 9.63 \)) than with female
colleagues (\( M_{\text{men}} = 3.60; M_{\text{women}} = 4.74 \)).

2.2.2.2 Social Identity Threat

Participants completed the same two item measure of social identity threat from study 1
(\( r \)s ranged from .60 - .84).

2.2.2.3 Daily Burnout and Working Memory Measures

Participants completed measures of psychological burnout and working memory. First, to
provide a shorter self-report measure of burnout, I selected the five items from the measure in
Study 1 that had the highest correlation with social identity threat (\( \alpha \)s ranged from .81 - .91; see
Appendix B.3). Second, participants completed a performance-based measure of working
memory. Working memory was chosen as past research has shown that social identity threat
impairs working memory (Schmader & Johns, 2003; Schmader et al., 2008), and workplace
burnout is associated with poorer performance on these types of tasks (Beck, Gerber, Brand,
Pühse, & Holsboer-Trachsler, 2013). Furthermore, a limitation from Study 1 is that I relied
solely on self-reported burnout as an outcome measure. Self-report measures are subject to a
number of shortcomings (e.g. common method variance and self-presentation bias); thus, to
address these shortcoming and to provide a performance-based outcome measure, working
memory was included in this study. This allowed me to test whether daily social identity threat
directly predicted lower working memory, or if working memory was related to social identity
threat through its link with psychological burnout.
To assess working memory, the memory updating task was selected as it has been shown to measure working memory equally well as more traditional working memory tasks (e.g. complex span tasks; Schmiedek et al., 2009) and it has been successfully used with naturalistic survey methods (e.g. event sampling; Riediger, Wrzus, Schmiedek, Wagner, & Lindenberger, 2011). In this task, participants have 6.5 seconds to memorize a 2x2 matrix of single digit numbers. They then have to update those numbers according to five sequential arithmetic operations (addition or subtraction) appearing randomly in the matrix. At the end of each trial, participants are presented with a blank matrix and asked to provide the final values for each position in the matrix (see Appendix B.4). For each matrix that participants complete, they get a score out of four which indicates how many correct values they provided. I varied the difficulty level of the task within-subjects by having participants complete either single digit arithmetic (moderate) or double digit arithmetic (difficult) for the updating operations. Pilot testing confirmed the distinction between the difficulty levels. Each day participants did one moderate and one difficult trial, presented in random order. Participants’ responses were scored by summing the total number of correct responses at each operational step for the moderate and difficult trial separately. For the two difficulty levels (moderate and difficult), participants received a score out of 4 for each day of data that they provided. Thus, a participant who provided 6 days of data would have 6 working memory scores for the difficult trials and 6 working memory scores for the moderate trials that were analyzed separately (and combined) using a multilevel model. Descriptive statistics for participant’s performance on the working memory task can be found in the results section of this chapter.
2.2.2.3 Person Level Measures

2.2.2.3.1 Demographic Variables

The demographic variables measured in Study 1 were also assessed in Study 2. Furthermore, participants provided their own initials to be used for matching in dyadic analyses.

2.2.2.3.2 Bias Measures

In Study 2, participants completed two measures of bias. Measures of both expected bias and the explicit and implicit tendency to associate men (more than women) with engineering were assessed. Expectations of bias were assessed using the stigma-consciousness measure from Study 1 ($\alpha = .79$).

Participants completed the brief implicit associations test (BIAT; Nosek, Bar-Anan, Sriram, Axt, & Greenwald, 2014; Sriram & Greenwald, 2009). The BIAT is a reaction time task that is used to quantify the strength of associations between conceptual categories. For my purposes, the BIAT was used to quantify the degree to which participants associate men (more than women) with engineering. In this task, participants see two conceptual categories presented at the top of the screen (e.g. Engineering and Male). In the center of the screen, exemplar words from one of four categories (e.g. Engineering, Family, Male, or Female) are presented. The participant’s task is to indicate whether the exemplar word belongs in either of the categories displayed at the top of the screen or not. The speed at which participants make their response is recorded. Participants complete six blocks of 20 trials. The blocks alternate such that for half, the categories presented at the top of the screen are stereotype consistent (e.g. Engineering and Male) and in the other half, the two categories are stereotype inconsistent (e.g. Engineering and Female). The order in which the blocks are presented is counter balanced across participants. The difference in average latency between the blocks in which the categories are stereotype
consistent (i.e., Engineering + Male) and those in which they are inconsistent (i.e. Engineering + Female) is taken to indicate differential association strengths (see Appendix B.6 for screenshots of the task). That is, individuals with a strong engineering = male bias will be much quicker to make judgments when the two category labels are stereotype consistent than when they are inconsistent. Participants latencies were converted into a D score using algorithms outlined by Nosek and colleagues (2014) with higher numbers indicating a stronger association between male and engineering (Nosek et al., 2014).

The four conceptual categories used in Study 2 are: Engineering, Family, Male, and Female. I chose family as the contrasting category for engineering because other IAT research has used it as a contrast against the category “career” to successfully capture unconscious gender bias (Nosek, Banaji, & Greenwald, 2002a). The exemplar words for each category can be found in Appendix B.5. The exemplar words for the categories Male and Female were taken from past research using the BIAT (see Sriram & Greenwald, 2009). The exemplar words for the categories “Engineering” and “Family” were the product of pilot testing in which participants were asked to quickly categorize exemplar words from the categories and engineering and family into their respective categories. For each category, the four words with the fastest response latencies were chosen as exemplar words.

To ensure that our implicit measure was distinct from explicit associations, participants completed an explicit measure assessing their tendency to associate men (more than women) with engineering. Using a slider scale that ranged from 0= Women to 100=Men, participants answered the following question: “Which group has the stronger association with Engineering? The order in which participants completed the BIAT and this item was counterbalanced.
In this study, and in Study 3, the measures of expected and endorsed (explicit and implicit) bias were completed in the first survey (i.e. before the 10 daily diaries) so that these predictor variables were assessed prior to measures of outcome variables. A limitation of this order is the possibility that completing these measures will elevate participants’ awareness of stereotyped associations in this study.

2.2.3 Study 3

2.2.3.1 Sample and Recruitment

Data for study 3 came from The Graduate School Study. Participants from Computer Science, Physics, and Engineering graduate programs were recruited via email advertisements sent out on graduate student listserves. I focused on these discipline as enrolment statistics showed they have low levels of female representation (<25%; Hill, Corbett, & St. Rose, 2010) making them likely arenas for the experience of social identity threat (Inzlicht & Ben-Zeev, 2000; Murphy et al., 2007; C. M. Steele et al., 2002). Participants were eligible to complete the study if they indicated on an initial recruitment survey that they were enrolled in graduate studies (Masters or PhD) in Computer Science, Physics, or Engineering, and interacted with people from their program (faculty, graduate students, or lab technicians) a couple of times a week or more. Note that the data is not dyadic in this study. Compensation was dependent on how many surveys the participants completed. Participants were paid $5 for each of the two longer surveys and $2 for each daily diary surveys.

Four hundred and forty seven participants (158 women, 298 men) completed the initial screening survey. We had planned for a minimum of 50 women and 50 men to carry out analyses. This target was established to balance attaining a sample size sufficient for data analysis against the constraints placed on data collection of this unique and difficult to recruit
sample (i.e., the scarce supply of female STEM graduate students). All eligible women (n = 86) who completed the screening survey were invited to participate. For each woman, the research team also contacted a male participant.

One hundred and fifty four participants (73 women, 81 men) completed the first survey. The final study sample was 120 graduate students (64 female, 56 male). As in the prior two samples, the final sample included only those participants who had data on all relevant study variables, as well as a sufficient number of conversations across the diary period to estimate effects. Furthermore, one participant was removed for providing outlandish responses on a number of measures (e.g. this participant consistently reported having over a thousand conversations a day). The attrition rate from the first to last survey was 22%, with men (31%) being significantly more likely to drop out than women (12%), $X(1)^2 = 6.62, p = .01$. Unlike the other two samples, the 33 participants who did not complete measures beyond the first survey did significantly differ on a number of survey measures. Participants who dropped out of the study scored significantly higher on measures of social identity threat ($b = -1.13, p < .001$), stigma consciousness ($b = -.69, p = .005$), and feeling undermined ($b = -1.18, p < .001$), and they had significantly lower scores on measures of feeling valued in graduate school ($b = .67, p = .002$) and perceived attitudes towards gender inclusive policies ($b = .52, p = .035$). These analyses suggest that there may be selection bias in our final sample; however, the sample is biased in a way that makes tests of our hypotheses more conservative (i.e., the final sample might underrepresent and therefore suffer from a restriction of range on the experience of identity threat).

The final sample came from 23 different universities from across North America, were mostly from engineering (71 engineering, 20 computer science, 28 physics, and 1 math) majors,
and were either Masters (59; 34 Female, 25 Male) or PhD (61; 30 Female, 31 Male) students. Participants had on average a bachelor’s degree, had completed 2.1 years of their respective program, published 1.87 papers, and had 1.84 first author publications, with no gender differences on any of these measures ($ps > .20$). The sample was mostly White (54 White, 17 South Asian, 16 Chinese, 7 Arab/Middle Eastern, 4 Southeast Asian, 2 West Asian, 2 Latin American, 2 Black, 1 Filipino, 1 Korean, and 14 participants selecting two or more of these ethnicities). The average age was 26.07 years old and there were no gender differences in age, $t(118) = .73, p = .469$.

2.2.3.2 Daily Measures

2.2.3.2.1 Conversational Measures

Participants completed the same Rochester Interaction Record that was used in Study 2 (acceptance $as$ ranged from .72-.94; hostility $rs$ ranged from .29-.94, $ps < .001$). The instructions for the Rochester Interaction Record were modified to make them relevant to graduate school (e.g. “Please take a couple of minutes to recall the most significant conversations that you had with other people in your graduate program today”). Participants completed an average of 8.47 daily surveys across the ten days ($SD = 1.89$, range 3-10) and provided an average of 1.56 work conversations per day. There were no gender differences in the number of conversations about work and the number of conversations with women, but there was a trend suggesting that men reported having more conversations with other men, $p = .098$. Not surprising in both men and women reported having more work conversations with male ($M_{men} = 7.43; M_{women} = 6.10$) than with female colleagues ($M_{men} = 4.55; M_{women} = 4.43$).
2.2.3.2.2 Social Identity Threat

Participants completed the two item measure of social identity threat from Studies 1 and 2 (rs ranged from .55-.84, p < .001).

2.2.3.2.3 Daily Burnout and Working Memory Measure

Participants completed the same measures of psychological burnout and working memory that were used in Study 2 (as ranged from .77-.89). The instructions for the five item self-report measure were modified to make them relevant to graduate school (e.g. “For each statement below, please select the option that best describes how you felt about working (e.g. course work, research, etc.) today”; see Appendix C.2).

2.2.3.3 Person Level Measures

2.2.3.3.1 Demographic Variables

Similar demographic variables assessed in Study 2 were also collected in Study 3. Some wording changes were made to reflect the new sample. For example, the status measure asked for participant’s year in graduate school (e.g. First year masters, Second year masters, First year PhD, etc.)

2.2.3.3.2 Bias Measures

Participants completed a 5 item measure of stigma-consciousness (Pinel, 1999; α=.76) and the BIAT (Sriram & Greenwald, 2009). The BIAT was modified such that the four conceptual categories used in study 2 are: STEM, Family, Male, and Female. This change was made to reflect the broader sample collected study 3. The exemplar words for the STEM category can be found in Appendix C.3. The single item measure of explicit associations was modified so that it read “Who do you tend to mentally associated with your program of study, and to what degree? (0=Female; 100=Male)
2.3 Results

2.3.1 Analytic Method

Within each sample, I will use multilevel modeling to test the following core hypotheses:

1) that women (but not men) would experience greater social identity threat on those days that their conversations with male (but not female) colleagues engender feelings of incompetence and a lack of acceptance (i.e., negative conversational reactions); 2) that this daily variation in social identity threat predicts greater daily psychological burnout for women (but not for men); 3) that for women, social identity threat will mediate the relationship between negative conversations and burnout; and 4) that negative biases held by women and men could together or independently moderate women’s daily experience of social identity threat. These four research questions will be examined in each of the three daily diary studies.

All models were estimated using R’s multilevel model lme4 package (version 1.1.12; Bates, Maechler, Bolker, & Walker, 2015) under restricted maximum likelihood. Multi-level models were specified such that there were day level equations (level 1) and person level equations (level 2). Predictor variables were grand-mean centered. Variables at level 2 (i.e. individual difference measures) were entered into models grand mean centered. Within-person predictor variables (level 1) were measured for each participant \( j \) \((j = 1, 2, \ldots, N)\) at days \( i \) \((i = 1, 2, \ldots, 10)\) and vary both between and within person. Because I wished to focus on within-subjects variation, I created a between-subjects and within-subjects version of these variables allowing for separate estimates of the within participant relationships and the between-participant relationships (e.g., see Kreft & de Leeuw, 1998; Enders & Tofighi, 2007). For example, individuals’ conversation ratings were split into two orthogonal components: a between subject’s means component \((\overline{X}_j)\), and a within subject deviations from those mean component
(\ddot{X}_{ij} - 
\bar{X}_{j}). In this example, the coefficient for the between-subjects means component estimates the between-subjects association between conversation ratings and the outcome variable of interest (e.g. do women with higher average conversation positivity across the 10-day diary period also have lower average social identity threat?). The coefficient for the within-subjects estimate is of focal interest: It estimates differences in outcome variables between positive and negative conversation days for the typical participant (e.g. on days where women experience negative conversations do they report higher levels of identity threat?). Finally, in each model, random effects for the intercept and the slope of within-participant relationships (i.e. within subject deviations from the participants mean component) were estimated as variance components with standard deviations.

2.3.2  Q1: Do Negative Work Conversations Predict Daily Fluctuation in Social Identity Threat for Women?

2.3.2.1  Study 1

I first conducted independent samples t-tests to test for gender differences in demographic variables. As summarized in Table 2-1, I was successful in matching the male and female samples on age, education, and number of prior career positions. However, men occupied higher status positions on average, reported marginally higher salaries, and had significantly more children than their female peers. In addition, women scored higher than men on stigma consciousness. However, including these covariates in models that test my primary hypotheses did not change any of the conclusions that I report.
Table 2-1. Means (SD) on demographic variables for male and female participants in study 1. The statistic for proportion married was estimated with a logistic regression.

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>33.20 (8.18)</td>
<td>33.88 (7.17)</td>
<td>.42</td>
<td>.679</td>
</tr>
<tr>
<td>education</td>
<td>4.44 (1.06)</td>
<td>4.16 (.48)</td>
<td>-1.64</td>
<td>.104</td>
</tr>
<tr>
<td># of children</td>
<td>.37 (.79)</td>
<td>.77 (.87)</td>
<td>2.38</td>
<td>.019</td>
</tr>
<tr>
<td>gross income</td>
<td>5.33 (1.42)</td>
<td>5.43 (1.28)</td>
<td>.38</td>
<td>.708</td>
</tr>
<tr>
<td>married</td>
<td>.84(0.44)</td>
<td>.95(.32)</td>
<td>2.91</td>
<td>.088</td>
</tr>
<tr>
<td># of career positions</td>
<td>2.27 (1.88)</td>
<td>1.86 (1.81)</td>
<td>1.07</td>
<td>.287</td>
</tr>
<tr>
<td>personal income</td>
<td>7.35 (2.10)</td>
<td>8.18 (2.47)</td>
<td>1.75</td>
<td>.083</td>
</tr>
<tr>
<td>status</td>
<td>2.20 (1.05)</td>
<td>2.90 (.91)</td>
<td>3.47</td>
<td>.001</td>
</tr>
<tr>
<td>stigma consciousness</td>
<td>4.29 (1.09)</td>
<td>3.48 (1.01)</td>
<td>-3.74</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Before testing my first hypothesis, I wanted to establish whether women were experiencing more social identity threat than men. Gender differences on the measure of social identity threat were tested using multilevel modeling. Data were structured hierarchically with day nested within person. To analyze the data, a series of multi-level modeling equations were constructed. Gender (0 = female; 1 = male) was entered in the model as a predictor of social identity threat. Consistent with hypotheses, women reported experiencing more daily social identity threat ($M = 3.26$) than did their male colleagues ($M = 2.02$), $b = -1.24, CI[-1.78, -.70], p < .001$. This effect of gender remained significant ($b = .86, CI[-1.37, -.34], p < .001$) when controlling for both stigma consciousness (grand mean centered) which was a significant covariate ($b = .56, CI[.33, .79], p <.001$) and relative status differences between conversation partners (group mean centered) which was not ($b = .01, CI[-.08, .06], p = .86$). Two participants (1 Male and 1 Female) were identified as outliers on the measure of social identity threat (absolute standardized residuals > 2.5) but excluding their data did not change the reported analyses; these participants were kept in all subsequent analyses.
Additional analyses revealed no evidence that conversations with male colleagues were experienced as more negative for women than for men, $b = .11$, CI[-.16, .39], $p > .40$, there was only a trend such that, collapsed across participant gender, conversations with men generated less positive thoughts ($M = 5.82$, CI[5.68, 5.95]) than did conversations with women ($M = 6.08$, CI[5.94, 6.22] see Table 2-2 for summary). Ratings of conversations with either men or women were not related to women’s stigma consciousness scores ($ps > .2$), and for men, stigma consciousness did not predict how well conversations went with other men ($p > .2$) but did marginally relate to how positively men rated their conversations with other women ($b = -.20$, CI[-0.43, 0.01], $p = .060$). Finally men and women reported similar levels of psychological burnout over the two weeks of testing, $b = -.11$, CI[-.45, .23], $p > .50$. Importantly, all of these variables showed substantial variation across the ten day testing period.

Table 2-2. Mean conversation positivity ratings with 95% confidence intervals in study 1.

<table>
<thead>
<tr>
<th>partner gender</th>
<th>participant gender</th>
<th>positivity mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>Female</td>
<td>5.79, CI[5.61, 5.96]</td>
</tr>
<tr>
<td>male</td>
<td>Male</td>
<td>5.91, CI[5.72, 6.10]</td>
</tr>
<tr>
<td>female</td>
<td>female</td>
<td>6.05, CI[5.85, 6.25]</td>
</tr>
<tr>
<td>female</td>
<td>Male</td>
<td>6.05, CI[5.83, 6.27]</td>
</tr>
</tbody>
</table>

Having established that women experience more daily social identity threat than men, I next tested the first of my core hypotheses: that women (but not men) would experience greater social identity threat on those days that their conversations with male (but not female) colleagues engender feelings of incompetence and a lack of acceptance (i.e., negative conversational reactions). Mean daily conversational reaction scores for work conversations by gender of conversation partner were calculated by collapsing across the number of work conversations that participants reported each day. Thus, if participants reported one work conversation with a male colleague on a given day, then the mean conversational reaction score will be computed from
that single conversation. If two work conversations with male colleagues are provided, then the mean will be computed by collapsing across those two conversations.

I tested two separate multilevel models assessing the predictive effect of positivity of conversations with men (model 1a) or with women (model 1b) on daily reports of social identity threat. Group mean centered positivity of work conversations, gender (female = 0; male =1), and the interaction terms were entered into a multi-level model predicting social identity threat.

Analysis of model 1a examining conversations with men revealed main effects of participant gender, \( b = -1.33, CI[-1.86, -.80], Z = 5.02, p < .001 \), and positivity of work conversations with men, \( b = -.37, CI[-.55, -.19], Z = 4.19, p < .001 \), that were qualified by a significant interaction between the two, \( b = .31, CI[.01, 61], Z = 2.11, p = .040 \). Among women, more negative work conversations with men predicted significantly greater social identity threat, \( b = -.42, CI[-.57, -.26], Z = -5.36, p < .001 \), but this relationship was not significant among men, \( b = .01, CI[-.24, .27], Z = -.11, p = .914 \).

The parallel test of positivity of work conversations with female colleagues (model 1b) yielded no significant main effect of this variable, \( b = .06, CI[-.20, .33], Z = .47, p = .639 \), and no significant interaction with participant gender, \( b = -.10, CI[-.48, .29], Z = -.49, p = .623 \). All effects remain significant when controlling for the relative status of conversation partner (\( b = -.04, CI[-.09, .03], p = .318 \)) and stigma consciousness (\( b = .56, CI[.33, 79], p < .001 \)). Thus, consistent with my first hypothesis, only on days when conversations with male colleagues cued feelings of incompetence and a lack of acceptance did women but not men experience higher levels of social identity threat. The results from model 1a and 1b are summarized Figure 2-1.
2.3.2.2 Study 2

In Study 2, I used the same analytic strategy as in Study 1: testing for gender differences in daily social identity threat and then establishing whether negative conversations with male colleagues are predictive of day-to-day variation in social identity threat for female participants.

I first conducted independent samples t-tests to test for gender differences in demographic variables. Four participants (2 Male, 2 Female) were identified as outliers (>2.5 standardized residuals) on the social identity threat measure; excluding their data did not change the reported analyses; their data were retained in all subsequent analyses. As summarized in Table 2-3, like Study 1, male participants tended score higher on a number of measures tapping into status: age, education, personal income, status, and women scored higher than men on
stigma consciousness. In all of the models that follow I make note of anytime that controlling for stigma consciousness and status changes my conclusion.

Table 2-3. Means (SD) on demographic variables for male and female participants in study 2. The statistic for proportion married was estimated with a logistic regression.

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>male</th>
<th>$T$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>34.01 (8.87)</td>
<td>36.36 (9.86)</td>
<td>2.05</td>
<td>.042</td>
</tr>
<tr>
<td>education</td>
<td>4.16 (0.86)</td>
<td>4.44 (1.29)</td>
<td>1.74</td>
<td>.083</td>
</tr>
<tr>
<td># of children</td>
<td>0.67 (1.02)</td>
<td>0.76 (0.96)</td>
<td>0.75</td>
<td>.453</td>
</tr>
<tr>
<td>gross income</td>
<td>5.96 (1.19)</td>
<td>6.03 (1.11)</td>
<td>0.42</td>
<td>.675</td>
</tr>
<tr>
<td>married</td>
<td>0.70 (0.46)</td>
<td>0.74 (0.44)</td>
<td>0.63</td>
<td>.529</td>
</tr>
<tr>
<td># of career positions</td>
<td>2.04 (1.91)</td>
<td>2.66 (1.97)</td>
<td>2.58</td>
<td>.011</td>
</tr>
<tr>
<td>personal income</td>
<td>5.01 (1.18)</td>
<td>5.50 (1.04)</td>
<td>3.47</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>status</td>
<td>2.54 (1.11)</td>
<td>2.75 (0.95)</td>
<td>1.68</td>
<td>.094</td>
</tr>
<tr>
<td>stigma consciousness</td>
<td>3.85 (1.23)</td>
<td>3.05 (1.09)</td>
<td>-5.59</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

Replicating findings from Study 1, women reported experiencing more daily social identity threat ($M = 2.78$) than did their male colleagues ($M = 2.59$), $b = -.45, CI[-.73, -.18], p = .002$. However, the effect of gender did not remain significant when controlling for stigma consciousness ($b = -.01, CI[-.12, -.26], p = .906$) which was a significant covariate ($b = .55, CI[.45, .65], p < .001$). In this sample, controlling for stigma consciousness consistently weakened effects where social identity threat was the dependent variable and the analyses was testing a between-subjects effect. A full discussion of the effect of controlling for stigma consciousness can be found in the final chapter.

Additional analyses revealed that both male and female participants reported conversations with male colleagues to be more negative (less accepting and more hostile) than conversations with female colleagues, $ps < .001$ (see Table 2-4). Participants high in stigma consciousness reported more negative conversations (less accepting and more hostile) with their
work colleagues \((ps < .01)\); this relationship did not significantly differ by the gender of the participant or conversation partner.

**Table 2-4. Means for conversation ratings with 95% confidence intervals in study 2.**

<table>
<thead>
<tr>
<th>partner gender</th>
<th>participant gender</th>
<th>acceptance mean</th>
<th>hostility mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>female</td>
<td>6.09, CI[5.97, 6.21]</td>
<td>1.87, CI[1.76, 1.99]</td>
</tr>
<tr>
<td>male</td>
<td>male</td>
<td>6.13, CI[5.99, 6.26]</td>
<td>1.86, CI[1.73, 2.00]</td>
</tr>
<tr>
<td>female</td>
<td>female</td>
<td>6.22, CI[6.09, 6.35]</td>
<td>1.67, CI[1.53, 1.81]</td>
</tr>
<tr>
<td>female</td>
<td>male</td>
<td>6.29, CI[6.15, 6.43]</td>
<td>1.68, CI[1.53, 1.82]</td>
</tr>
</tbody>
</table>

### 2.3.2.2.1 Conversations with Male Colleagues

In Study 2, negative conversations were parsed into conversations that engender a lack of acceptance and conversations that are considered hostile, and both were entered separately and then simultaneously as predictors of social identity threat in a series of parallel analyses. I tested two separate multilevel models assessing the predictive effect of *feelings of acceptance* in conversations with men (model 1a), and the predictive effect of *perceived hostility* in conversations with men (model 1b) on daily reports of social identity threat. In each model, I tested the interaction of these variables with participant gender, but also consistently report the simple slopes for men and women separately (even in the absence of a significant interaction) to better compare effect sizes gleaned from this sample to compare with Sample 1.

Analysis of model 1a revealed a significant interaction between participant gender and feelings of acceptance during conversations with men, \(b = 0.32, CI[0.10, 0.53]\), \(Z = 2.90, p = .004\). Among women, more negative work conversations with men predicted significantly greater social identity threat, \(b = -0.34, CI[-0.47, -0.21]\), \(Z = -5.04, p < .001\), but this relationship was not significant among men, \(b = -0.02, CI[-0.19, 0.15]\), \(Z = -0.20, p = .842\). Controlling for stigma consciousness did not change any of these results.
In the second model (1b), hostility during conversations with men showed the same pattern of results: there was a significant interaction between participant gender and feelings of hostility during conversations with men, $b = -0.16$, $CI[-0.31, 0.01]$, $Z = -2.01$, $p = .047$. Female participants reported higher levels of identity threat on days in which they reported having hostile conversations with their male colleagues, $b = 0.15$, $CI[0.06, 0.24]$, $Z = 3.33$, $p = .001$, but men showed no relationship between the two variables $b = -0.01$, $CI[-0.13, 0.12]$, $Z = -0.14$, $p = .889$. Controlling for stigma consciousness did not impact any of these results.

A third model in which acceptance and hostility were considered as simultaneous predictors was planned but because of the high degree of multi-collinearity between the two predictors ($rs$ range from -.40 to -.90; $VIF = 3.2$), the results of this model were uninterpretable (i.e., suppressor effects resulted in a negative relationship between hostility and social identity threat for female participants). To better understand which predictor was more strongly related to social identity threat, I computed a semi partial-$R^2$ from the first two models to establish effect sizes for each predictor (Edwards, Muller, Wolfinger, Qaqish, & Schabenberger, 2008). For female participants, a lack of acceptance during conversations with male colleagues explained only slightly more variance in social identity threat than did the experience of hostility (acceptance $R^2 = .19$; hostility $R^2 = .15$). The effect size estimates suggest that acceptance concerns and perceived hostility might have similarly sized relationships with social identity threat; however, it is difficult to draw strong conclusions without testing a model in which acceptance and hostility are considered as simultaneous predictors. In the discussion section I will consider possible approaches to measuring acceptance and competence using measures that co-vary to a lesser degree.
2.3.2.2 Conversations with Female Colleagues

Finally, I ran two parallel models in which I considered feelings acceptance (model 2a) and feelings hostility (model 2b) during conversations with women as predictors of social identity threat. The first model (2a) showed no relationship between acceptance during work conversations with female colleagues and daily identity threat for female participants, $b = -0.03$, CI[-0.23, 0.17], $Z = -0.28$, $p = .781$, no significant interaction with participant gender, $b = -0.08$, CI[-0.39, 0.23], $Z = -0.51$, $p = .610$, and no significant relationship between the two variables for men, $b = -0.11$, CI[-0.35, 0.13], $Z = -0.91$, $p = .364$. Similarly, the second model (2b), testing hostility of work conversations with female colleagues predicting identity threat also showed no significant effects: For female participants, there was a marginal relationship between the hostility of conversations with their female colleagues and social identity threat, $b = 0.15$, CI[-0.02, 0.33], $Z = 1.69$, $p = .096$, but for men this relationship was non-significant, $b = 0.08$, CI[-0.10, 0.26], $Z = 0.83$, $p = .411$, and there was no interaction by gender, $b = -0.08$, CI[-0.33, 0.18], $Z = -0.60$, $p = .554$. Models in which acceptance and hostility were entered simultaneously were not explored because of the high degree of covariation between the two measures ($rs$ range = -.45 to -.86). Results from the model 1a-2b are summarized in Figure 2-2. Controlling for stigma consciousness did not change any of these conclusions.
Figure 2-2. Simple slopes for work conversations predicting daily social identity threat study 2.

Taken together these analyses provide evidence, consistent with Study 1, that on days when conversations with male colleagues cued a lack of acceptance, women experienced higher levels of social identity threat. However, in these analyses I was unable to fully differentiate whether acceptance or hostility concerns were more important for day-to-day identity threat. In the discussion section I consider how to better measure acceptance and hostility concerns.

2.3.2.3 Study 3

The analytic strategy in Study 3 was identical to Study 2. Tests for gender differences in demographic variables (summarized in Table 2-5) revealed that the sample was pretty well matched: women scored higher than men on stigma consciousness, and there was a trend such that men reported having higher personal salaries than women. Stigma consciousness was considered as a covariate in analyses that follow and places where controlling for it changes conclusions are noted.
Table 2-5. Means (SD) on demographic variables for male and female participants in study 3. The statistic for proportion married was estimated with a logistic regression.

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
<th>t</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>25.81 (3.34)</td>
<td>26.36 (4.82)</td>
<td>0.73</td>
<td>.469</td>
</tr>
<tr>
<td>education</td>
<td>1.33 (0.47)</td>
<td>1.38 (0.49)</td>
<td>0.61</td>
<td>.545</td>
</tr>
<tr>
<td># first author publications</td>
<td>1.00 (2.27)</td>
<td>0.96 (1.98)</td>
<td>-0.09</td>
<td>.927</td>
</tr>
<tr>
<td># publications</td>
<td>1.73 (2.89)</td>
<td>2.02 (2.84)</td>
<td>0.54</td>
<td>.590</td>
</tr>
<tr>
<td># of children</td>
<td>0.12 (0.45)</td>
<td>0.16 (0.56)</td>
<td>0.38</td>
<td>.702</td>
</tr>
<tr>
<td>gross income</td>
<td>2.44 (1.52)</td>
<td>2.40 (1.42)</td>
<td>-0.16</td>
<td>.877</td>
</tr>
<tr>
<td>married</td>
<td>0.45 (0.50)</td>
<td>0.34 (0.48)</td>
<td>-1.27</td>
<td>.205</td>
</tr>
<tr>
<td>personal income</td>
<td>1.59 (0.67)</td>
<td>1.85 (0.97)</td>
<td>1.72</td>
<td>.088</td>
</tr>
<tr>
<td>stigma consciousness</td>
<td>3.75 (1.28)</td>
<td>3.28 (1.19)</td>
<td>-2.06</td>
<td>.042</td>
</tr>
</tbody>
</table>

Consistent with Studies 1 and 2, female graduate students reported experiencing marginally more daily social identity threat \((M = 2.71)\) than did their male peers \((M = 2.64)\), \(b = -.40, CI[-.85, .04], p = .079\). Note that outlier analyses revealed that two participants (1 male and 1 female) had large residuals (i.e. > 2.5 standard deviations) relative to the rest of the sample. Examining these participants’ data revealed that both participants consistently responded with the highest possible ratings (i.e., 7) on the social identity threat items. Removing these participants resulted in a somewhat stronger effect of gender, \(b = -42, CI[-.84,.01], p = .056\). Analyses that follow were run on the full sample and places where removing the two outliers significantly changed conclusions were noted. Like in Study 2, the effect of gender was weakened by controlling for stigma consciousness \((b = -.23, CI[-.65, .20], p = .295)\), which was a significant covariate \((b = .37, CI[.20, .54], p < .001)\).

Additional analyses revealed no evidence that conversations with male colleagues were experienced as more negative (i.e. less accepting and more hostile) for women than for men, \(b = .12, CI[-.16, 0.42], p = .393\), that conversations with women were experienced as more positive,
\( b = 0.08, CI[-0.04, 0.19], p = .188 \) (see Table 2-6), or that women experienced higher levels of psychological burnout over the two weeks of testing, \((M.female = 3.66, SD = 1.24, M.male = 3.56, SD = 1.28) b = -0.10, CI[-0.41, 0.21], p = .553\). Stigma consciousness was related to lower acceptance during conversations, and this relationship was present regardless of the gender of the participant or conversation partner \((ps < .05)\). Feelings of hostility during conversations was, surprisingly, only related to stigma consciousness during conversation with women \((ps < .05)\) and not men \((ps > .17)\), and this was true for both male and female participants. This pattern was unexpected and failed to replicate in any other samples so I’m hesitant to interpret it further.

Table 2-6. Means for conversation ratings with 95% confidence intervals in study 3.

<table>
<thead>
<tr>
<th>partner gender</th>
<th>participant gender</th>
<th>acceptance mean</th>
<th>hostility mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
<td>6.02, CI[5.82, 6.22]</td>
<td>1.65, CI[1.46, 1.84]</td>
</tr>
<tr>
<td>Female</td>
<td>Female</td>
<td>6.04, CI[5.81, 6.26]</td>
<td>1.83, CI[1.60, 2.05]</td>
</tr>
<tr>
<td>Male</td>
<td>Male</td>
<td>6.16, CI[5.94, 6.37]</td>
<td>1.69, CI[1.49, 1.89]</td>
</tr>
<tr>
<td>Female</td>
<td>Male</td>
<td>6.30, CI[6.06, 6.54]</td>
<td>1.61, CI[1.37, 1.84]</td>
</tr>
</tbody>
</table>

Next, I replicated analyses from study 2 to test whether negative conversations were contributing to women’s day-to-day experience of social identity threat. The analytic strategy was the same: first test how feelings of acceptance and hostility in conversations with male colleagues contribute to participants’ day-to-day reports of identity threat and then test the same predictions for conversations with female colleagues.

\(^{1}\) For female participants, stigma consciousness was more strongly related to acceptance when talking with other women (vs. men; interaction \( b = .16, CI[-.27, -.03], p = .01\)), however, this was driven by women low in stigma consciousness reporting higher levels of acceptance when talking to women (vs. men, \( b = -.27, CI[-.54, -.01], p = .038\)). I didn’t see this pattern of results replicate in any other studies so I don’t discuss it any further.
2.3.2.3.1 Conversations with Male Colleagues.

Consistent with Study 2, I tested two separate multilevel models assessing the predictive effect of feelings of acceptance in conversations with men (model 1a), and the predictive effect of perceived hostility in conversations with men (model 1b) on daily reports of social identity threat. In model 1a, feelings of acceptance in conversations with men, showed a significant interaction with participant gender, $b = 0.35$, $CI[0.03, 0.67]$, $Z = 2.12$, $p = .040$. Among women, feelings of acceptance during conversations with male colleagues were significantly negatively related to daily social identity threat, $b = -0.31$, $CI[-0.53, -0.08]$, $Z = -2.65$, $p = .011$, but this relationship was not significant among men, $b = 0.04$, $CI[-0.19, 0.28]$, $Z = 0.37$, $p = .711$. These results remained significant when controlling for stigma consciousness.

Hostility during conversations with men (model 1b) showed a somewhat different pattern of results. Although the interaction between participant gender and feelings of hostility during conversations with men was not significant, $b = -0.14$, $CI[-0.37, 0.09]$, $Z = -1.19$, $p = .241$, female participants reported higher levels of identity threat on days in which they had hostile conversations with their male colleagues, $b = 0.19$, $CI[0.02, 0.36]$, $Z = 2.19$, $p = .032$, whereas men showed no relationship between these two variables, $b = 0.05$, $CI[-0.11, 0.21]$, $Z = 0.57$, $p = .574$. Conclusions remained consistent when controlling for stigma consciousness.

As in Study 2, hostility and acceptance ratings were highly correlated ($r_s$ range = -.48 to -.86; $VIF = 2.03$) making it impossible to reliably estimate parameters in models in which the two variables were entered simultaneously. To establish an effect size for the relationship between conversation ratings and social identity threat, I computed a semi partial $R^2$ (Edwards et al., 2008). In this study, for female participants, work conversations with male colleagues that
engendered a lack of acceptance were more strongly related to social identity threat ($R^2 = .12$) than hostile conversations with male colleagues ($R^2 = .05$).

### 2.3.2.3.2 Conversations with Female Colleagues

Finally, I ran two models (2a and 2b) that examined ratings of conversations with female colleagues as predictors of social identity threat. In the model 2a, I tested the relationship between acceptance during work conversations with female colleagues and social identity and found no significant relationship for female participants, $b = -0.00, CI[-0.22, 0.22], Z = -0.02, p = .985$, no significant interaction with participant gender, $b = -0.16, CI[-0.55, 0.23], Z = -0.80, p = .425$, and no relationship between the two variables for male participants, $b = -0.16, CI[-0.49, 0.16], Z = -0.97, p = .332$. In model 2b, I tested feelings of hostility during work conversations with female colleagues as a predictor of social identity threat, and the results were similar to the first model: there was no relationship between the two variables for female participants, $b = -0.03, CI[-0.25, 0.19], Z = -0.24, p = .818$, or male participants, $b = 0.13, CI[-0.17, 0.42], Z = 0.84, p = .412$, and no interaction by gender, $b = -0.15, CI[-0.52, 0.21], Z = -0.81, p = .428$.

Models in which acceptance and hostility were entered simultaneously were not explored because of the high degree of covariation between the two measures ($rs$ range = -.74 to -.95). The results from models 1a, 1b, 2a, and 2b are summarized in Figure 2-3. Conclusions from these...
models were unchanged by controlling for stigma consciousness.

![Graph of feelings of acceptance and hostility in conversations predicting daily social identity threat in study 3.](image)

**Figure 2-3. Simple slopes for work conversations predicting daily social identity threat in study 3.**

### 2.3.2.4 Summary

Results from the three studies consistently show that women in STEM settings experience identity threat on days when conversations with male colleagues cue a lack of acceptance. Hostility during conversations with men was also predictive of women’s experience of daily social identity threat. Unfortunately, I was unable to fully test how acceptance and hostility simultaneously contribute to the experience of social identity threat. Examining the semi partial $R^2$ for each effect is inconclusive; although, estimates from the larger sample in Study 2 would suggest that the effect sizes are similar. However, it is difficult to draw strong conclusions without testing a model in which both acceptance and hostility concerns are considered as simultaneous predictors of identity threat. In the discussion section, I outline possible ways
measure acceptance and competence during conversations that would results in less correlated estimates of the two constructs.

2.3.3 Q2: Does Daily Social Identity Threat Predict Psychological Burnout and Working Memory for Women?

2.3.3.1 Study 1

My second hypothesis was that daily social identity threat would predict daily fluctuations in psychological burnout, more so for women than for men. A multi-level model was used to test this moderated relationship for self-reported burnout. This analysis revealed a significant relationship between social identity threat and burnout, $b = .22$, CI[.14,.31], $Z = 5.39$, $p < .001$, that was qualified by a significant gender by social identity threat interaction, $b = -.20$, CI[-.36, -.04], $Z = -2.49$, $p = .016$. Follow up analyses revealed that, as hypothesized, daily fluctuation in social identity threat predicted significantly greater burnout among women, $b = .22$, CI[.13,.31], $Z = 5.17$, $p < .001$, but not among men, $b = .02$, CI[-.1,.15], $Z = .40$, $p = .686$. Again, all significant effects remain even when controlling for the relative status of conversation partner ($b = .07$, CI[.01,.12], $p = .016$) and stigma consciousness ($b = .12$, CI[-.05,.28], $p = .155$). Thus, for women, on days in which they reported feeling social identity threat they also experienced more psychological burnout.

2.3.3.2 Study 2

The same model tested in Study 2 showed consistent patterns of results. Analyses revealed a significant interaction between participant gender and social identity threat, $b = -0.13$, CI[-0.25, -0.01], $Z = -2.17$, $p = .031$. Consistent with Study 1, daily fluctuation in social identity threat predicted significantly greater burnout among women, $b = 0.18$, CI[0.11, 0.25], $Z = 5.23$, $p
< .001, but not among men, \( b = 0.05, CI[-0.05, 0.15], Z = 1.03, p = .304 \). These results remained consistent when controlling for stigma consciousness.

I next used a similar model to test if daily social identity threat predicts day-to-day fluctuations in working memory. Past research has shown that social identity threat hinders performance only for very challenging cognitive tasks (Beilock, Rydell, & McConnell, 2007; O’Brien & Crandall, 2003). Thus, I tested whether social identity threat impairs performance on the most difficult memory updating problems. I hypothesized that women, and not men, would score more poorly on the working memory task on days that they reported feeling social identity threat.

Before testing my primary hypothesis, I wanted to verify that performance on the working memory task varied by item difficulty and was related to scores on a self-report burnout measure. Prior to running this analysis, I explored outlying cases in order to identify participants whose performance was so poor that it suggested that they were not taking the task seriously. Ten participants were identified as outliers (i.e. having working memory scores 2.5 SDs away from the rest of the sample). These were participants who for the most part did not get a single working memory item correct across the 10 day study period. Data from these participants were excluded from all analyses involving working memory. Including these participants in the analyses did not change any of the conclusions reported in this section.

Consistent with expectations, participants performed worse on the difficult items (\( M = 2.57, CI[2.46, 2.69], Range = 0-4 \)) than the moderate items (\( M = 3.50, CI[3.44, 3.56], Range = 0-4, b = 0.93, CI[0.83, 1.03], Z = 18.32, p < .001 \), and there was a significant relationship between overall (medium and high demand) working memory performance and burnout, \( b = -0.10, CI[-0.19, -0.01], Z = -2.21, p = .027 \). Note that the relationship between burnout and working
memory was marginally significant for the high demand items \( (b = -0.07, CI[-0.13, 0.00], Z = -1.94, p = .054) \) and non-significant for the medium demand items \( (b = -0.03, CI[-0.08, 0.02], Z = -1.32, p = .189) \) suggesting that the high demand items might be more sensitive to daily fluctuations in burnout.

Having established that the high demand items were more challenging than the low demand items, I turned my attention to my primary hypothesis, and I tested whether on days on that women experience a high degree of social identity threat they also experience lower working memory. In a multilevel model, participant gender (Female = 0, Male = 1), daily social identity threat (group mean centered), and the interaction between the two variables were used to predict participants’ performance on the high demand working memory problems. This model revealed no relationship between daily social identity threat and working memory performance for either women, \( b = -0.06, CI[-0.14, 0.03], Z = -1.32, p = .191 \), or men, \( b = -0.02, CI[-0.15, 0.10], Z = -0.36, p = .721 \), and no identity threat by gender interaction, \( b = 0.04, CI[-0.12, 0.19], Z = 0.45, p = .651 \). There was, however, a unexpected main effect of gender, \( b = -0.26, CI[0.03, 0.49], Z = 2.22, p = .027 \), such that female participants performed better \( (M = 2.73, CI[2.57, 2.88]) \) than male participants \( (b = 2.47, CI[2.30, 2.64]) \). Although this finding was unexpected, women’s scores were not so high that it precluded my ability to test my hypothesis of interest.

Exploratory analyses that examined performance on the medium demand items and the combined medium and high demand items showed a similar pattern of results, \( ps \) for main effect for female participants > .18. Thus, I did not find evidence for the hypothesis that women exhibit lower working memory on days that they reported feeling social identity threat.
2.3.3.3 Study 3

Like in Studies 1 and 2, a multi-level model was used to test whether gender moderated any relationship between daily social identity threat and self-reported burnout. In Study 3, patterns of results were consistent with Studies 1 and 2: there was a marginal interaction between participant gender and social identity threat, $b = -0.17$, $CI[-0.34, -0.00]$, $Z = -1.98$, $p = .053$, such that daily fluctuation in social identity threat predicted significantly greater burnout among women, $b = 0.17$, $CI[0.07, 0.27]$, $Z = 3.25$, $p = .002$, but not among men, $b = -0.00$, $CI[-0.13, 0.13]$, $Z = -0.01$, $p = .994$. The results were not changed by controlling for stigma consciousness.

Working memory scores were analyzed using the same analytic strategy as study 2. Three participants were removed for consistently have working memory scores of zero across the 10-days (2.5 SDs away from the rest of the sample). Consistent with Study 2, participants performed better on the low demand items ($M = 3.68$, $CI[3.61, 3.74]$) than the high demand items ($b = 2.78$, $CI[2.63, 2.93]$, $b = 0.89$, $CI[0.76, 1.03]$, $Z = 13.18$, $<.001$, but, in this sample, there was no relationship between performance on the working memory task and self-reported burnout, $b = -0.06$, $CI[-0.16, 0.05]$, $Z = -1.07$, $p = .286$.

Tests of my primary hypothesis revealed a marginal interaction between participant gender and social identity threat, $b = 0.16$, $CI[-0.02, 0.34]$, $Z = 1.79$, $p = .074$, with men showing a marginally negative relationship between identity threat and performance on the high demand working memory items, $b = -0.13$, $CI[-0.27, 0.00]$, $Z = -1.89$, $p = .059$, but no significant relationship for female participants, $b = 0.03$, $CI[-0.08, 0.14]$, $Z = 0.51$, $p = .612$. Note that in this sample, women ($M = 2.68$, $CI[2.48, 2.89]$) did not score better than men ($M= 2.91$, $CI[2.69, 3.12]$), in fact, there was a trend for men to outperform women, $b = 0.22$, $CI[-0.07, 0.52]$, $Z = 1.48$, $p = .140$. 
Exploratory analyses that examined performance on the medium demand items and the combined medium and high demand items showed a similar pattern of results: no relationship between identity threat and working memory for female participants ($ps > .80$), a trend when looking at men’s performance on the combined medium and high demand items ($b = -0.16, CI[-0.36, 0.03], Z = -1.64, p = .110$) but not for medium demand items only ($b = -0.03, CI[-0.15, 0.10], Z = -0.41, p = .686$). As the results for male participants are contrary to predictions, only marginally significant, and did not replicate in Sample 2, I will not discuss or interpret them further.

### 2.3.3.4 Summary

In sum, the results from this section provide partial support for my hypothesis that social identity threat predicts cognitive burnout for women. Female participants consistently showed a relationship between daily identity threat and day-to-day self-reported burnout. That is, across three samples, on days where women reported a high degree of social identity threat they also reported being more burned out at work. I did not find evidence, however, that daily social identity threat predicted detriments in working memory capacity. In past experimental research, manipulations of identity threat results in working memory impairments immediately following or in the context of a performance situation. The delay between the threatening conversation and the working memory measure in these studies could be one reason for the lack of relationship between social identity threat and working memory; for a fuller examination of this point, see the final chapter.
2.3.4 Q3: Does Social Identity Threat Mediate the Relationship Between Negative Work Conversations and Psychological Burnout?

2.3.4.1 Study 1

In this set of analyses I wanted to test whether social identity threat statistically mediates the relationship between negative conversations with male colleagues and self-reported workplace burnout for women in STEM. I tested for mediation with nested data using a non-parametric bootstrap. In these analyses, I tested the indirect (i.e., mediated) effect separately for men and for women while also testing the omnibus moderated mediation analysis (for a diagram of the mediation model see Figure 2-4). As depicted in Figure 2-4, all paths were modeled to be moderated by gender, which enabled a single mediation model where the indirect effect for female participants (path a*b) was expected to differ from the indirect effect for male participants. Moderating all paths by gender is also consistent with my hypotheses. That is, cross-sex conversations are expected to be where women (but not men) experience social identity threat (path a) and burnout (path c) because these conversations, especially when they elicit negative self-perceptions, have the potential to elicit the group-based categorization processes that underlie social identity threat (Schmader et al., 2008; C. M. Steele et al., 2002). Also, given experimental evidence that social identity threat impairs working memory capacity (Schmader et al., 2008) and promotes ego-depletion (Inzlicht et al., 2011) for women but not men in STEM settings, I expected the link between social identity threat and burnout (path b) to also be moderated by gender. In summarizing the results below, I will describe the separate test of indirect effects for women and for men first followed by the test of moderated mediation.

Analyses estimating the conditional indirect effect for women revealed a significant path between the positivity of conversations with men and social identity threat (path a: b = -.36, CI[-
0.52, -0.17]), a significant path between social identity threat and burnout (path b: $b = 0.14$, CI[0.07, 0.25]), and a significant indirect effect ($ab = -0.06$, CI[-0.11, -0.02]). The same model estimated for men yielded non-significant paths for path a: $b = -0.06$, CI[-0.28, 0.18]; and path b: $b = 0.01$, CI[-0.15, 0.14]), and the total indirect effect was non-significant, ($ab = 0.0004$, CI [-0.02, 0.02]). These results are consistent with the hypothesis that social identity threat is a mechanism by which cross-sex conversations for women in engineering elicit greater psychological burnout. However, it should be noted that the test of the full moderated mediation model did not yield a significant moderation of the indirect effect by gender of participant, $ab = -0.05$, CI[-0.14, 0.003], perhaps due to a lack of statistical power.

Figure 2-4. Path diagram of the mediation model tested in Studies 1 - 3.

2.3.4.2 Study 2

The same test of mediation was employed for Study 2. I also analyzed a second set of mediation models in which I tested whether social identity threat mediated the relationship between hostile conversations and burnout. Like in Study 1, these analyses test the hypothesis
that for women, social identity threat is a mechanism by which negative conversations with men in STEM workplaces result in greater psychological burnout.

The test of the indirect effect among female participants revealed a significant path between the positivity of conversations with men and social identity threat (path a: $b = -0.34$, $CI[-0.46, -0.22]$), a significant path between social identity threat and burnout (path b: $b = 0.18$, $CI[0.14, 0.29]$), and a significant indirect effect ($ab = -0.06$, $CI[-0.11, -0.04]$). The same model estimated for men yielded non-significant paths for a and b (path a: $b = -0.02$, $CI[-0.16, 0.11]$; path b: $b = 0.06$, $CI[-0.01, 0.19]$, and a non-significant indirect effect, $ab = 0.00$, $CI[-0.02, 0.01]$. In this larger sample, the test of the moderated mediation, with all paths moderated by gender, was marginally significant, ($ab = -.04$, $CI[.10, 0.00]$, $Z=-1.69$, $p = .09$).

Next, I ran parallel mediation models in which I tested whether social identity threat mediated the relationship between conversations hostility with male colleagues and workplace burnout for female engineers. These models revealed a similar pattern of results: female participants showed evidence of social identity threat mediating the relationship between hostility during conversations with male colleagues (path a: $b = 0.15$, $CI[0.06, 0.25]$; path b: $b = 0.20$, $CI[0.16, 0.31]$; indirect effect, $ab = 0.03$, $CI[0.02, 0.07]$), but for male participants there was not a significant indirect effect ($ab = 0.00$, $CI[-0.01, 0.02]$, path a: $b = -0.01$, $CI[-0.13, 0.08]$, path b: $b = 0.08$, $CI[0.01, 0.22]$). However, the test of moderated mediation was not significant, $ab = 0.00$, $CI[-0.01, 0.01]$, $Z = 1.26$, $p = .21$. Finally, I aimed to estimate whether social identity threat played a larger explanatory role in mediating the link between either accepting or hostile conversations with men and burnout. To do so, I computed the percentage for which path c was reduced by the addition of social identity threat to the mediation models for female participants.
The percentages of variability explained were similar, about 27% for hostility and 22%, for acceptance.

2.3.4.3 Study 3

The same set of mediation models were tested in Study 3 with the sample of graduate students. First, I tested my specific prediction that for female participants, social identity threat will mediate the relationship between negative conversations with men and burnout. For the relationship between feeling a lack of acceptance with male colleagues and burnout, there was no evidence for significant mediation by social identity threat for female participants ($ab = -0.05$, $CI[-.11, .03]$, $Z = -.89$, $p = .373$). This was surprising given that both path a (the relationship between conversations with men and social identity threat) and path b (the relationship between were statistically significant (path a: $b = -0.30$, $CI[-.54, -.12]$; path b: $b = 0.16$, $CI[-.08, .26]$). The same was true when testing for mediation of the relationship between hostility and burnout: identity threat failed to mediate this relationship for female participants, even though the two indirect paths were significant, $ab = 0.03$, $CI[-.00, .10]$, $Z = .51$, $p = .61$; path a: $b = 0.19$, $CI[0.03, 0.45]$; path b: $b = 0.10$, $CI[-0.01, 0.30]$).

Finally, for both acceptance and hostility, men did not show evidence of mediation (acceptance: $ab =-0.00$, $CI[-.04, .02]$; hostility: $ab = 0.00$, $CI[-0.01, 0.03]$), and tests of the moderated mediation were not significant (acceptance: $ab = -0.05$, $CI[-0.18, 0.04]$; hostility: $ab = 0.02$, $CI[-0.02, 0.15]$).

2.3.4.4 Summary

Taken together, the results of Studies 1-3 provide partial support for my hypothesis that for women in STEM workplaces, social identity threat partially explains the relationship between negative conversations with male colleagues and workplace burnout. In the two professional
engineering samples, I found that social identity threat was a significant mediator of the relationship between negative conversations with men (either those that are hostile or cue a lack of acceptance) and workplace burnout for female participants. Although these same effects were not observed for men in the samples, tests of moderated mediation were not significant. Study 2, in which the sample was the largest, showed a moderated mediated effect that was trending towards significance ($Z = -1.69, p = .09$), suggesting that low power might be a problem for testing this model in these samples.

I failed to find evidence of mediation in Study 3. This is possibly because of the weaker relationship between social identity threat and burnout in this sample. The burnout measure asked participants to reflect on how burned out they were with their graduate coursework and research. It is possible that graduate work is less collaborative and therefore not as strongly related to interpersonal factors like social identity threat. Future work should look to tease apart whether identity threat is more strongly related to burnout and disengagement in the parts of STEM that are more interpersonal – see the last chapter for a full discussion of this point.

2.3.5 Q4: Is Women’s Daily Experience of Social Identity Threat Moderated by the Negative Biases Held by the Women or by Their Male Conversation Partners?

2.3.5.1 Study 1

My final research question in this chapter examines whether negative biases held by male and/or female participants can exacerbate women’s experience of identity threat. In Study 1, I tested if female participants who were high in stigma-consciousness were particularly vulnerable to experiencing social identity threat during negative conversations with male colleagues. This would be evidenced by women who score highly on stigma-consciousness experiencing higher level of social identity threat during negative cross-sex conversations.
A multilevel model was used to assess the moderating role of stigma consciousness in the relationships between positivity of work conversations with men and daily social identity threat. This analysis tested whether women who were high in stigma-consciousness were more likely to experience social identity threat when conversations with men were perceived as negative. Grand mean centered stigma-consciousness and group mean centered positivity of work conversations, gender (female = 0; male =1), and the two- and three-way interaction terms were entered into a multi-level model predicting social identity threat.

This model revealed a non-significant interaction between gender, positivity of work conversation with men, and stigma-consciousness, \( b = .08, CI[-.19, .35], Z = .70, p = .58 \). Thus I found no evidence that women’s expectations of bias made them more vulnerable to experiencing social identity threat when conversations with their male colleagues were negative. There was however, a marginal two-way interaction between participant gender and stigma consciousness, \( b = -0.43, CI[-0.88, 0.02], Z = -1.85, p = .067 \), such that women showed a significant relationship between stigma consciousness and daily social identity threat, \( b = 0.73, CI[0.43, 1.04], Z = 4.75, p < .001 \), whereas men only showed a marginal relationship between the two variables, \( b = 0.34, CI[-0.02, 0.70], Z = 1.85, p = .067 \). This pattern of results is consistent with past work showing that women high in stigma consciousness are more vulnerable to the experience of identity threat (Brown & Pinel, 2003a).

2.3.5.2 Study 2

In study 2, I tested hypotheses using the dyadic subset of the data. However, because the dyadic analyses were carried out on a subset of the full sample, I first aimed to replicate and extend the same analyses done in study 1.
2.3.5.2.1 Non-Dyadic Analyses

Using the full sample of data, I tested two hypotheses: (1) do women who are high in stigma consciousness experience higher levels of social identity threat during negative conversations with men?, and (2) do women who have a strong tendency to implicitly associate men with engineering experience higher levels of social identity threat during negative conversations with men? For each hypothesis, I tested two different models: (1) a model examining whether bias moderates the relationship between feeling a lack of acceptance in conversations with men and social identity threat, and (2) a model testing whether bias moderates the relationship between feeling hostility during conversations with men and social identity threat.

First, I tested whether stigma consciousness moderated the relationship between social identity threat and negative conversations with male colleagues. I found no evidence of moderation by stigma consciousness for conversations that engendered a lack of acceptance (three way interaction: $b = -0.01$, $CI[-0.15, 0.18]$, $Z = 0.26$, $p = .796$) or conversations that were rated as hostile (three way interaction: $b = -0.00$, $CI[-0.10, 0.12]$, $Z = 0.13$, $p = .900$). However, in both cases there was marginal interaction between participant gender and stigma consciousness, similar to what was observed in Study 1, (acceptance: $b = -0.20$, $CI[-0.41, 0.01]$, $Z = -1.88$, $p = .061$; hostility: $b = -0.20$, $CI[-0.41, 0.01]$, $Z = -1.84$, $p = .066$); women showed a significant positive relationship between stigma consciousness and social identity threat ($b = 0.73$, $CI[0.43, 1.04]$, $Z = 4.75$, $p < .001$) as did men but to a lessor degree ($b = 0.41$, $CI[0.25, 0.57]$, $Z = 5.12$, $p < .001$)

Next I moved to testing my hypothesis regarding the IAT. Before testing my primary hypothesis, I first established that participants showed an implicit tendency to associate male
with engineering and that participants’ IAT scores were reasonably independent from their explicit reports of male=engineering bias. Consistent with expectations, participants showed a significant association between male and engineering ($M = .21, CI[0.16, 0.25]$; test against zero, i.e. no association: $t(262) = 8.38, p < .001$), with men and women doing so to an equal degree ($b = 0.06, t(262) = 1.16, p = .248$). Participants showed a similar pattern of results on the measures of the explicit associations such that they associated engineering with male ($M = 72.86, CI[70.88, 74.83]$; test against the scale midpoint, i.e. natural association: $t(262) = 22.80, p < .001$), but for this measure, men ($M = 69.14$) did so to a lesser degree than did women ($M = 75.89$), $t(262) = -3.42, p < .001$. Importantly, the degree of correlation between participants implicit and explicit associations was only marginally significant and relatively small ($r = .11, p = .070$), suggesting that the IAT was tapping into bias that was not captured by participants’ explicit responses.

Having done these preliminary analyses, I moved on to testing my primary hypothesis. I fit two models in order to test whether participants’ implicit associations moderated the degree to which they experienced social identity threat during negative conversations with men. In both models, I predicted daily social identity threat from participant gender (female = 0, male = 1), ratings of conversations with male colleagues (person mean centered), IAT score (grand mean centered), and the interactions between these variables, while controlling for the explicit tendency to associate male with engineering (grand mean centered).

*Implicit bias and conversational acceptance.* First, I tested a model in which I moderated the relationship between feelings of acceptance during conversations with men and social identity threat by participant gender and IAT score. In this analysis, participants’ explicit bias scores was not a significant covariate ($b = -0.00, CI[-0.01, 0.01], p = .522$), but there was a
marginal main effect of participants’ IAT scores, \( b = 0.43, CI[-0.06, 0.91], Z = 1.73, p = .084 \), a significant interaction between participant gender and IAT scores, \( b = -0.88, CI[-1.60, -0.16], Z = -2.39, p = .018 \), and a marginal three-way interaction (participant gender * acceptance during conversations with men * IAT score), \( b = -.50, CI[-0.86, 0.09], Z = -1.85, p = .067 \).

I first broke down the significant two-way interaction by exploring the simple slopes for the relationship between implicit bias and daily identity threat for male and female participants (see Figure 2-5). Female participants showed a marginal positive relationship between IAT scores and the daily experience of social identity threat, \( b = 0.43, CI[-0.05, 0.91], Z = 1.76, p = .079 \), such that, a stronger association between male and engineering was associated with higher daily social identity threat. For men, the relationship was negative but non-significant, \( b = -0.43, CI[-0.95, 0.10], Z = -1.60, p = .110 \). Examining these effects at high and low levels of implicit bias, I found that the gender difference in social identity threat was significant at high levels of bias (\( b = 0.77, CI[0.37, 1.16], Z = 3.83, p < .001 \)) but not a low levels (\( b = 0.10, CI[-0.30, 0.49], Z = 0.49, p = .627 \)), meaning that women with more positive implicit associations showed lower daily levels of identity threat that were equivalent to men.
Figure 2-5 Simples slopes for implicit bias moderating the relationship between gender and social identity threat in study 2.

For exploratory purposes, I also sought to understand the marginal three-way interaction by testing the simple slopes of gender at each combination of implicit gender bias and conversation positivity (see Figure 2-6). Among those with a strong tendency to associate engineering with men, the gender difference in social identity threat was significant both when conversations with male colleagues were positive ($b = 0.72, CI[0.30, 1.13], Z = 3.37, p < .001$) or negative ($b = 0.86, CI[0.41, 1.30], Z = 3.78, p < .001$). However, among those with a weaker association of men with engineering, the gender difference in social identity threat was only significant when conversations with men were negative ($b = 0.36, CI[-0.08, 0.81], Z = 1.60, p = .109$), but not when conversations with men were positive ($b = -0.20, CI[-0.62, 0.22], Z = -0.93, p = .355$). This pattern of results suggests that women with less biased implicit associations
might be better able to reap benefits (i.e., reduced identity threat) from positive conversations with men; whereas, women with negative implicit associations more consistently experience identity threat regardless of how well their conversations are going with their colleagues.

![Figure 2-6 Simples slopes for implicit bias moderating the relationship between conversations and social identity threat in study 2.](image)

*Implicit bias and conversational hostility.* Next, I tested a similar model in which I moderated the relationship between feelings of hostility during conversations with men and social identity threat by participant gender and IAT score, while controlling for participants’ explicit tendency to associate male with engineering (not a significant covariate, $b = -0.00$, $CI[-0.01, 0.01]$, $p = .500$). In this model, the only significant effects were a significant main effect of IAT scores, $b = 0.42$, $CI[-0.06, 0.91]$, $Z = 1.70$, $p = .009$, and the same two-way interaction between participant gender and IAT scores, $b = -0.88$, $CI[-1.60, -0.15]$, $Z = -2.38$, $p = .018$
presented in Figure 2-5. The three-way interaction between participant gender, hostility of conversations with men, and social identity threat was not significant, $b = -0.09$, $CI[-0.46, 0.23]$, $Z = -0.63$, $p = .526$.

2.3.5.2.2 Dyadic Analyses

In Study 2, I intended to use the dyadic subset of the data (170 participants; 85 dyads) to test how biases held by male and female participants contribute to the experience of social identity threat during conversations. I planned to examine two research questions: 1) Do women’s implicit biases (as distinct from their male partner’s) make them particularly vulnerable to negative conversations that cue social identity threat? 2) Do men’s implicit biases (as distinct from their female partner’s) elicit social identity threat for women? My original analytic plan was to isolate conversations in which participants reported speaking with their matched partner and use the data from these conversations to test my research questions. However, in isolating conversations that took place between the dyads, I discovered that only 97 participants provided data from a conversation with their matched partner; furthermore, there were only 66 participants (33 dyads) for which both members of the dyad provided data for conversations with their matched partner, and this number was reduced to 52 participants (26 dyads) when I excluded non-work conversations. Because my sample of dyadic data was substantially reduced from what I had anticipated when data collection was stopped, I decided to modify my analytic approach.

In an effort to take advantage of the full sample of dyadic data, I decided not to analyze conversation level data within dyads, and instead looked at the degree to which participants’ own biases and their partners’ biases predicted day-to-day fluctuations in social identity threat and cognitive burnout. I predicted that women’s experience of identity threat and burnout would be predicted by their male partners’ biases. For men I expected there to be no relationship.
I tested my hypotheses using a multilevel model for dyadic diary data. In these models the three levels of dyadic diary data (days nested within persons nested with dyads) are treated as two levels of random variation; the lower level represents variability due to within-person repeated measures for male and female participants, and the upper level represents between dyad variability (Bolger & Laurenceau, 2013; West, 2013). In each model, I simultaneously tested for actor and partner effects (Kashy, Kenny, Reis, & Judd, 2000) on participants’ daily reports of identity threat and burnout. These models allowed me to capture unique variance in how individuals’ own IAT and stigma consciousness scores predict their daily experience identity threat and burnout (actor effect) and how their partners’ IAT and stigma consciousness scores predict identity threat and burnout.

*Predicting social identity threat from actor and partner IAT.* I first tested whether there was a relationship between participants’ daily experience of social identity threat and their own and partner’s IAT scores. Although this relationship was significant for women in the full sample, this model revealed no-relationship between participants own IAT scores and their daily experience of identity threat for either men (b = -.28, Z = -0.91, p = .36) or women (b = .49, Z = 1.34, p = .18) in this reduced sample. The same pattern of results was found for partner IAT scores: women showed no relationship between their male partner IAT scores and daily identity threat (b = .32, Z = 1.00, p = .31), and men showed no relationship between partner IAT scores and identity threat (b = -.01, Z = -.04, p = .96).

*Predicting burnout from actor and partner IAT.* There was similar pattern of results when actor and partner IAT scores were considered as predictors of daily burnout. Both male and female participants showed no significant relationships between their own or their partners’ IAT scores and daily burnout. Female participants showed no relationship between their own IAT
score and daily burnout ($b = .29, Z = 1.06, p = .290$) and the same was true for male participants ($b = -.14, Z = -0.53, p = .594$). Partner’s IAT scores were also not predictive of identity threat for male ($b = .00, Z = .01, p = .99$) or female ($b = .18, Z = .77, p = .440$) participants.

**Predicting social identity threat from actor and partner stigma consciousness.** Actor and partner effects of stigma consciousness showed a somewhat different pattern of results. For daily identity threat, men and women’s own stigma consciousness ratings significantly predicted their daily experience of social identity threat (men: $b = .39, Z = 3.92, p < .001$; women: $b = .59, Z = 7.44, p < .001$), just as it did in the full sample. However, there was no relationship between partner ratings of stigma consciousness and men’s ($b = 0.08, Z = .91, p = 363$) or women’s ($b = -.09, Z = 1.01, p = .31$) daily experience of identity threat.

**Predicting burnout from actor and partner stigma consciousness.** The same model but with daily burnout as the outcome variable revealed a different pattern of results: the only significant relationship was between women’s own stigma consciousness ratings and their daily burnout ratings, $b = .21, Z = 2.97, p = .003$; this relationship was not significant for male participants, $b = .13, Z = 1.48, p = .140$, and the relationship between partner stigma consciousness ratings and burnout was negative but non-significant for male ($b = -.05, Z = -.66, p = .506$) and female participants ($b = -.11, Z = -1.39, p = .139$).

In sum, I failed to find any evidence of partner effects on participant’s daily identity threat and burnout scores; however, this is not overly surprising given the low number of conversations that participants were reporting with their partner; perhaps if interactions between dyads had been more common (i.e. making up a larger portion of participants daily experiences) we would have seen stronger relationship between the two partner biases and social identity
threat and burnout – see the final chapter for fuller discussion of this limitation and possible ways that it could be addressed.

2.3.5.3 Study 3

Study 3 did not have dyadic data, so the analytic strategy is similar to the first set of analyses described in Study 2. Specifically, I tested whether female participants’ explicit and implicit biases made them vulnerable to experiencing social identity threat during negative conversations with their male colleagues.

Like in Study 1 and the first set of analyses in Study 3, stigma-consciousness and implicit bias were tested as separate moderators of the relationships between negative work conversations with men and social identity threat. I hypothesized that women high in either of these measures of bias would be more likely to experience social identity threat during negative conversations with men (Brown & Pinel, 2003b; Forbes & Schmader, 2010).

Models examining stigma consciousness as a moderator revealed no support for my hypotheses. There was no evidence that stigma consciousness moderated the relationships between social identity threat and feelings of acceptance during conversations with men (three-way interaction: $b = 0.07$, CI[-0.14, 0.36], $Z = 0.85$, $p = .393$) or feelings of hostility during conversations with men and social identity threat ($b = -0.21$, CI[-0.34, 0.18], $Z = -0.77$, $p = .443$). Finally, none of the interactions involving stigma consciousness reached statistical significance ($p > .400$), although stigma consciousness was positively associated with daily social identity threat overall (i.e., main effect: $b = .36$, $p < .001$) and for male ($b = .30$, $p = .022$) and female ($b = .42$, $p < .001$) participants separately. Thus, I failed to replicate the pattern from Study 2 in which stigma consciousness moderated the gender difference in daily social identity threat more strongly for female (vs. male) participants, but I still found that women who reported being high
in stigma consciousness also reported experiencing more social identity threat; however, in this sample, the same was true for male participants.

Next I moved to testing my hypothesis regarding the IAT. Before testing my primary hypotheses I established that participants showed an implicit tendency to associate male with engineering and that participants’ IAT scores were reasonably independent from their explicit reports of bias. Consistent with expectations, participants showed a significant association between men and engineering ($M=0.11$, $CI[0.04, 0.19]$; test against zero, i.e. no association: $t(117) = 3.18$, $p = .002$), with men and women doing so to an equal degree ($b = 0.02$, $t(117) = 0.31$, $p = .754$). Participants showed a similar pattern of results on the measures of the explicit associations such that they associated STEM with male ($M = 63.46$, $CI[60.09, 66.84]$; test against the scale midpoint, i.e. men and women equally associated with STEM: $t(117) = 7.90$, $p < .001$), with men ($M = 69.14$) and women ($M = 75.89$) doing so to an equal degree, $b = -0.33$, $t(117) = 3.43$. Importantly, the degree of correlation between participants implicit and explicit associations was not significant ($r = -0.07$, $p = .457$), suggesting that the IAT was tapping into bias that was not captured by participants’ explicit responses.

I moved on to testing my primary hypothesis regarding the IAT: women’s implicit associations would moderate the degree to which they experienced social identity threat during negative conversations with men. Analyses revealed no support for this hypothesis. Implicit bias did not moderate the relationship between social identity threat and feeling a lack of acceptance during conversations with men (three-way interaction: $b = 0.00$, $CI[-0.70, 0.75]$, $Z = 0.05$, $p = .962$), and the same was true for conversations rated as hostile (three way interaction: $b = 0.18$, $CI[-0.65, 0.62]$, $Z = 0.14$, $p = .887$). In both models, explicit bias was not a significant covariate ($ps > .900$), there was no main effect of IAT scores ($ps > .450$), and none of the interactions
involving IAT scores were significant, $ps > .450$. Thus, in this sample of STEM graduate students, I failed to replicate the significant effect from study 2 in which participants’ IAT scores moderated the gender difference in daily social identity threat.

2.3.5.4 Summary

Across the three studies, I saw limited evidence for the hypotheses that women’s daily experience of social identity threat in conversations is moderated by the negative biases they themselves hold. However, in studies 1 and 2, I found that women who reported being low in stigma consciousness (study 1) or who did not show a strong tendency to associate male with engineering (study 2) also reported lower levels of daily social identity threat. This pattern of results is consistent with other research showing that women low on stigma consciousness (Brown & Pinel, 2003a) or the tendency to associate male with STEM on an IAT are less vulnerable to the experience of social identity threat (Brown & Pinel, 2003a; Forbes & Schmader, 2010). This pattern of results is promising as it suggests that interventions designed to improve women’s implicit biases or lower stigma consciousness might impact their day-to-day experience of identity threat. However, these effects must be interpreted cautiously as they did not replicate in Study 3 (the graduate student sample).

In Study 2, I also found a marginal pattern of results such that women who showed a weak implicit tendency to associate men with engineering might be better able to reap benefits (i.e., reduced identity threat) from positive conversations with men; whereas, women with negative implicit associations more consistently experience identity threat regardless of how well their conversations are going with their colleagues. Again, these effects must be interpreted cautiously because the interaction testing for moderation was only marginally significant and did not replicate in Study 3.
Finally, the dyadic analyses, reported in Study 2, were limited because participants rarely provided data for conversations with their matched partner. To overcome this limitation, I examined instead how partner biases related to men and women’s daily experience of identity threat and burnout but found no evidence of significant partner effects. The lack of partner effects could be due to conversations with the matched partner only making up a small portion of the daily interactions that were found in earlier analyses to predict fluctuation in identity threat. Future work might look to test these hypotheses in a lab setting where groups of men and women interact with one another and the amount of contact can be more tightly controlled. For a fuller consideration of this point see the final chapter.
Chapter 3: Contextual Moderators of Identity Threat

3.1 Chapter Overview

In Chapter 3 of my dissertation I examine whether contextual features of STEM workplaces that signal inclusivity can reduce social identity threat for women. This question will be tested in the two daily diary studies and one experiment. These three studies seek to answer two research questions: First, I will examine gender inclusive policies and female representation as two separate organizational cues that might relate to reduced social threat for women in STEM settings. Second, I will test whether gender inclusive cultural cues relate to women’s day-to-day workplace conversations. And finally, I will try to establish if gender inclusive cues predict reduced identity threat by improving women’s day-to-day conversations.

3.1.1 Overview of Samples and Study Designs

Across three studies, I examined gender inclusive policies and female representation as two separate organizational cues that might reduce the experience of social threat for women in STEM workplaces. In Study 1, I employed an experiment in which I manipulated the gender inclusivity of an imagined engineering workplace and measured the degree to which engineering undergraduates expected to experience social identity threat and have positive workplace interactions while working at the company. Studies 2 and 3 take their samples from the Healthy Workplace Study and Engendering Engineering Success, respectively, and in these studies I tested whether the effects found in Study 1 replicate in engineering workplaces among professionals. Across the three studies, I tested hypotheses that gender inclusive organizational cues would predict lower levels of social identity threat for women in engineering either directly by acting as a signal of a threat free environment, or indirectly by predicting more positive
interactions with male as compared to female colleagues. I also tested competing hypotheses for whether cues to an inclusive culture would predict outcomes for men.

3.2 Methods

3.2.1 Study 1

3.2.1.1 Design, Sample, and Recruitment

Study 1 was an experiment designed to establish whether perceiving gender inclusive cues in an engineering workplace would lead women to anticipate experiencing less social identity threat when imagining working at that company. Building on past studies that have successfully used experimental methodologies to test questions regarding the benefits and costs of workplace diversity policies (Kaiser et al., 2013; Purdie-Vaughns, Steele, Davies, Ditlmann, & Crosby, 2008), I recruited a sample of engineering undergraduates and had them watch a video about an engineering company. In the video I manipulated two things orthogonally: The number of female engineers and the number of gender inclusive policies present at the company. After the video, participants were asked to anticipate whether they would experience social identity threat in that setting. Participants also made ratings of anticipated workplace interactions with other engineers at that company so that I could test whether gender inclusive cultural cues reduce anticipated identity threat by improving the anticipated tenor of workplace interactions.

Participants from engineering undergraduate programs were recruited via email advertisements sent out on university listserves. One-hundred and eleven engineering departments were initially invited to share the study information on their student listserves. The final sample included 258 (152 women and 106 men) engineering undergraduates from 11
different universities. This sample includes only those participants who completed all measures\(^2\). Note that women outnumbered men in the final sample because of extra recruitment done to ensure that I had a sample of at least 100 male participants, which was our a priori target for each gender group.

Participants had completed 2.64 (SD=1.35) years of university and had an average age of 21.08 (SD = 2.76). There were no gender differences on the number of years of university completed (\(M_{male}=2.68, M_{female}=2.61, t(244) = -0.43, p = .665\)) but men tended to be somewhat older than women in the sample (\(M_{male} = 21.47, M_{female} = 20.80, t(243)=-1.86, p = .065\)). Age was not a significant covariate when included in any of the primary analyses (\(ps > .35\)) and thus was not retained in any of the reported statistical models. Participants were compensated with entry into a prize draw for a $50 amazon gift card, with a one in 50 chance of winning.

3.2.1.2 Procedure

Participants were invited to take part in an online study about attitudes towards engineering workplaces. In the first part of the study, participants were asked to watch a short video about an engineering company called CCB. In the video, participants viewed a purported summary of findings from an analysis of CCB’s demographics, policies, and practices. Participants were first exposed to demographic information about CCB’s engineering workforce. Here participants saw a chart showing the number of male and female engineers employed at

\(^2\) An additional 443 participants started the survey but did not complete it. Because gender was assessed at the end (to avoid priming it earlier), possible gender differences in attrition are unknown. Analyses of the 195 participants who dropped out after being assigned to condition suggested a marginally higher drop-out rate among participants assigned to view a company with a high number of gender inclusive policies and a high number of female engineers compared to the other three conditions (dropout rate =35% vs. 45%, 51%, 50%), \(X(2) = 7.33, p = .062\).
CCB. In the low female representation condition, participants learned that 10% of the engineering workforce at CCB is female. For the high representation condition, participants learned that 40% of the engineering workforce at CCB is female (see Appendix D.2 for screenshots). These numbers were chosen based upon data collected in the Study 2 showing that female representation at the companies ranged between 0% and 50%. Thus, varying the conditions between 10% and 40% female seemed like a reasonable representation of reality. The charts were accompanied by pictures that were ostensibly of CCB employees. The pictures differed across the two conditions such that the proportion of men and women in the pictures matched the information presented in the chart. The pictures were pilot tested so that they matched on perceived age, ethnic diversity, and education level.

Next, participants saw two checklists. The first checklist detailed the policies and practices that the report had identified as being in place at CCB. The next checklist identified the policies and practices identified as lacking at CCB. In all conditions, there were seven policies listed as being present at CCB and four policies listed as absent. In the high gender inclusive policy condition, five of the policies that were present were gender inclusive (e.g. “Programs and workshops to create cultural norms for positive working relations between genders”) and none of the policies absent were gender inclusive. In the low gender inclusivity condition, only two of the policies that were present at CCB were gender inclusive and three of the policies listed as absent were gender inclusive (see Appendix D.3 for screenshots). The gender inclusive policies that were used in this study were chosen to match those used in Study 2. The spread between the high and low gender inclusive conditions (5 vs. 2) was chosen to match one standard deviation above and below the mean of company’s gender inclusive policy ratings in the Study 2 sample of actual engineers. The other six policies were unrelated to gender and were created based upon
commonly used policies and practice in engineering companies (e.g. “Reimbursements for relevant classes or degree programs”).

The video ended with a summary of the findings of the report that further emphasized the manipulation (e.g., CCB’s company policies and programs currently include 7 out of 11 of the best practices in the industry.”). After viewing the video, participants were asked to take two minutes to imagine what it would be like to work at CCB based on the information provided in the video. Participants then completed the dependent measures and provided demographic information.

### 3.2.1.3 Dependent Measures

Below I describe the dependent measures relevant to the present research questions; a complete list of measures used in this research can be found in Appendix D.1. The dependent measures are summarized in the order they were presented to participants.

#### 3.2.1.3.1 Anticipated Conversation Ratings

Participants completed a two item measure designed to assess anticipated feelings of competence and acceptance ($r = .53, p < .001$) during interactions with engineering colleagues. They also made ratings of how often they thought they would feel a sense of conflict and hostility ($r = .73, p < .001$) when interacting with their engineering colleagues (see Appendix D.5). Ratings were made on a 1-7 scale ranging from “Never” to “Always”. The gender of the person they were interacting with was not specified in these items to avoid drawing attention to the hypotheses; it was assumed, however, that participants would typically imagine speaking with a male engineer given the low representation of women in engineering.
3.2.1.3.2 **Anticipated Social Identity Threat**

Participants completed a modified version of the social identity threat measure used in studies 1-3 in chapter 2. The items were changed to reflect the anticipation of social identity threat as an employee in the company (\( \alpha = .89 \); e.g. “If you worked at CCB, how often do you think that people would think about your gender when judging you?”; see Appendix D.4 for full scale) and were rated on a scale from on a 1-7 scale ranging from “Never” to “Always”.

3.2.1.3.3 **Manipulation Checks**

As a check of the female representation manipulation, participants were asked, using a ten point scale (0%-100%), to estimate the number of female engineers employed at CCB. To check the manipulation of gender inclusive policies, participants rated their agreement with following statement, using a 1-7 scale (1=Strongly Disagree; 7=Strongly Agree): “CCB has a large number of policies/practices that would benefit female employees”. Finally, to ensure that participants were paying attention to the video, they were asked to complete a memory test. Participants were presented with the 11 policies that were shown in the video and asked to check the ones that were present at CCB.

3.2.1.3.4 **Stigma Consciousness**

Participants completed the four item measure of stigma consciousness (\( \alpha_{male} = .47 \), \( \alpha_{female} = .70 \); Pinel, 1999) that was used in Studies 1-3 in Chapter 2.

3.2.2 **Study 2**

3.2.2.1 **Sample and Recruitment**

Participants for Study 1 came from the Healthy Workplace Study. The sample is exactly as reported in Chapter 2.
3.2.2.2 Organizational Predictors

In the survey that was completed after the daily diary component, participants completed measures of two organizational variables. To assess perceptions female representation, participants were asked to estimate the percentage of female engineers at their company (on a 0-100% scale); the average score was 17.88%, and the range was 0% to 50%. In addition, the perception of gender inclusive policies and practices was assessed with a 15 item checklist (Hughes, 2012; see Appendix A.5). Participants responded to items such as, “Does your organization have physical working conditions (equipment, clothing, shower, and toilet facilities) appropriate for men and women?” For each item participants had the following response options: “Yes”, “No”, and “I don’t know.” The number of “Yes” responses was summed for each participant. Scores on this scale ranged from 2-15. These two organizational variables were moderately positively correlated, \( r = .35, p < .001 \).

3.2.2.3 Dependent Variables

Social identity threat (2 items) and conversation positivity (9 items), as described in Chapter 2, were considered as dependent variables.

3.2.3 Study 3

3.2.3.1 Sample and Recruitment

Participants for Study 3 come from Engendering Engineering Success. The sample is exactly as it was reported in Chapter 2.

A limitation from Study 2 is that I relied on participants’ reports of gender inclusive cues in the workplace. This meant relying upon participant’s knowledge of gender inclusive policies in their workplace and their ability to accurately estimate the number of female engineers. Thus, I’m limited in the conclusions I draw from the results using these estimates; that is, the question
arises as to what degree participant reports tap into the objective reality of the workplace or participants perceptions of the workplace. To address these problems I recruited one employee from human resources (HR) for a subsample of the companies in this dataset. The HR employee completed a one-time survey that contained measures female representation and gender inclusive policies practices for each organization. The idea being that HR employees would be able to complete the surveys with access to the objective information about female representation and gender inclusive policies and practices. I was able to collect HR data from 21 of the 28 companies included in my dataset. This meant that for 171 engineering participants (out of 269 participants (engineers)) I had parallel HR data. Analyses for Study 3 will primarily use the full sample of participants (i.e. 269), and only when an analysis included HR reports will the sub-sample (i.e. 171) of participants be used.

3.2.3.2 Organizational Predictors

3.2.3.2.1 Sample of Engineers

Participants completed the same measure of female representation that was used in study 1; the average score was 24.72%, with a range between 1% and 85%. As in Study 2, perceptions of gender inclusive policies was assessed using a checklist in which participants were asked to indicate if a policy/practice was present at their organization using the following response options: “Yes”, “No”, and “I don’t know.” The number of “Yes” responses was summed for each participant. To make this measure both more comprehensive and consistent with other work examining the benefits of gender inclusive policies (Nishii, 2013), participants now completed a 20 item checklist that was divided across five subsections: Flexible work programs, Work life balance programs, Promoting health and safety of employees, Recruitment retention and advancement in engineering, and Promoting a gender inclusive culture (see Appendix B.7). The
number of “Yes” responses across all of the subscales except “Promoting health and safety of employees” was summed to create a count of gender inclusive policies and practices for each participant. The health and safety policies were included only as filler policies unrelated to gender inclusivity. Scores on this scale ranged from 2-15. Initial analyses showed that these two organizational variables uncorrelated, $r = .07, p = .267$; however, closer examination of the data revealed that the lack of correlation was largely due to a single outlier (standardized residual = 3.44) who reported working in a company that had a high percentage of women (80%) but few gender inclusive policies (2); excluding this participant resulted in a positive correlation between the two organizational variables, $r = .13, p = .031$. Data from this participant were included in all subsequent analyses and excluding their data does not change any of the conclusions reported. In Study 2, organizational predictors were completed in the survey that comes before the daily diary components.

3.2.3.2.2 Sample of HR Employees

Female representation was measured with four questions; participants were asked to give the percentage of female non-managerial engineers, female engineers in front lines, female engineers in senior management, and female engineers on board of directors. The average of these four responses was taken as the estimate of female representation for a given company. Gender inclusive policies were measured using an expanded version (53 items) of the checklist completed by the sample of engineers. The number of “Yes” responses across all of the items that overlapped with the items completed by the engineering sample was summed to create a count of gender inclusive policies and practices for each participant. Scores on this scale ranged from 5-14. The two organization variables were not correlated $r = .022, p = .89$. There was also no correlation between HR reports of female representation and participant reports, $r = .003, p =$
.98; however, HR reports of policies did correlate with engineers’ reports, $r = .56$, $p = .007$. The lack of correlation for female representation between the HR and the engineering sample could in part be due participants using their immediate workgroups or offices to estimate the percentage of female engineers, whereas HR professional were relying upon companywide aggregates when answering the same questions.

3.2.3.3 Dependent Variables

Social identity threat (2 items) feelings of acceptance in conversations, (5 items) and perceived hostility during conversations (2 items), as described in chapter 2, were considered as dependent variables.

3.3 Results

3.3.1 Analytic Method

Study 1 uses ANOVA and regression to test hypotheses and employs analytic practices recommended for analyzing between-subjects data (e.g. all continuous variables are grand mean centered; Cohen, Cohen, West, & Aiken, 2003). The path model in study 1 was estimated using the r package lavaan (version 0.5. 20, Rosseel, 2012). Studies 2 and 3 use multilevel models to test all hypotheses. Like chapter 2, multi-level models were specified such that there were day level equations (level 1) and person level equations (level 2). Predictor variables were grand-mean centered. Individual difference measures were entered into models grand mean centered. Level 1 variables were separated into a between-subjects ($\bar{X}_{ij}$) and within-subjects versions ($\bar{X}_{ij} - \bar{X}_{j}$) allowing for separate estimates of the within participant relationships and the between-participant relationships. For variables measured at level 1, the coefficient for the within-participant estimate is of focal interest. Finally, in each model, random effects for the
intercept and the slope of within participant relationships (i.e. within subject deviations from the participants mean component) were estimated as variance components with standard deviations.

3.3.2 Q1: Do Cues to an Inclusive Culture Predict Between-Person Variation in Social Identity Threat Among Women and Not Men?

3.3.2.1 Study 1

Before I tested my primary hypothesis, I first sought to establish that participants’ responses to manipulation check questions and the memory test were as hypothesized.

First, I tested that the manipulation of the number of gender inclusive polices changed participants perception of how many gender inclusive polices were present at the company in the video. A 2(female representation: high vs. low) x 2(gender inclusive polices: high vs. low) x 2(gender: male vs. female) ANOVA on participants’ perception of gender inclusive policies revealed the predicted main effect of the policy manipulation, \( F(1, 238) = 7.16, p < .01, d = .37, d_{CI} [.11, .62] \), such that participants in the high gender inclusive policy condition reported there were more gender inclusive policies (\( M = 4.42; SD = 1.29 \)) than did participants in the low gender inclusive policy condition (\( M = 3.97; SD = 1.26 \)). No other main effects or interactions were significant, \( ps > .1 \). See Table 3-1 for a summary of the means across the different conditions.

Next, an analysis of memory for policies at the end of the study revealed that participants’ average performance on the memory test was 8.74 (SD=2.32; Range=2-11) out of a possible 11, which is significantly greater than chance, \( t(245)=25.27, p < .001 \). Unexpectedly, a 2(female representation: high vs. low) x 2(gender inclusive policies: high vs. low) x 2(gender: male vs. female) ANOVA revealed that participants’ memory for these policies was also affected
by other aspects of the design. Participants correctly remembered significantly more policies in the high gender inclusive policy condition ($M = 9.03$, $SD = 2.12$) than in the low gender inclusive policy condition ($M = 8.32$, $SD = 2.46$), $F(1, 238) = 5.79$, $p = .017$, $d = -.36$, $d.CI[-.61, -.11]$. This significant effect of policy condition was qualified by a marginally significant three-way interaction, $F(1, 238) = 3.44$, $p = .065$. Follow-up analyses suggested that this pattern was driven by one condition in which women remembered significantly more policies than did men: when participants saw a company that was high in both female representation and gender inclusive policies, ($M_{female} = 9.77$, $SD = 1.65$; $M_{male} = 8.59$, $SD = 2.31$), $t(238) = -1.17$, $p = .039$, $d = -.92$, $d.CI[-1.42, -.41]$. Although not predicted, this pattern of results might suggest that these combined cues to inclusivity increased women’s motivation to process information about the company. See Table 3-1 for a summary of the means across the different conditions.

Finally, analyses of participants’ perceptions of the percentage of women in the company yielded a somewhat complex pattern of results. A $2$(female representation: high vs. low) $x$
Table 3-1. Summary of the manipulation check means with 95% confidence intervals in study 1.

<table>
<thead>
<tr>
<th>participant gender</th>
<th>policy count</th>
<th>female representation</th>
<th>female representation manipulation check</th>
<th>memory test</th>
<th>policy manipulation check</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>high</td>
<td>low</td>
<td>1.90, CI[1.39, 2.41]</td>
<td>8.50, CI[7.50, 9.50]</td>
<td>4.45, CI[3.88, 5.02]</td>
</tr>
<tr>
<td>female</td>
<td>low</td>
<td>low</td>
<td>1.91, CI[1.56, 2.25]</td>
<td>8.88, CI[8.20, 9.57]</td>
<td>3.93, CI[3.54, 4.32]</td>
</tr>
<tr>
<td>female</td>
<td>high</td>
<td>low</td>
<td>2.23, CI[1.85, 2.61]</td>
<td>9.29, CI[8.53, 10.04]</td>
<td>4.37, CI[3.94, 4.80]</td>
</tr>
<tr>
<td>male</td>
<td>low</td>
<td>low</td>
<td>2.95, CI[2.47, 3.44]</td>
<td>8.05, CI[7.09, 9.00]</td>
<td>4.27, CI[3.73, 4.81]</td>
</tr>
<tr>
<td>male</td>
<td>high</td>
<td>high</td>
<td>3.50, CI[3.10, 3.90]</td>
<td>8.59, CI[7.80, 9.38]</td>
<td>4.56, CI[4.12, 5.01]</td>
</tr>
</tbody>
</table>
2(gender inclusive polices: high vs. low) x 2(gender: male vs. female) ANOVA on this variable revealed the predicted main effect of female representation, $F(1, 238) = 89.72, p < .001, d = 1.28, d.CI[1.00, 1.56]$. Participants in the high representation condition reported that more female engineers were employed at the company $M = 36.8\%, SD = 9.4\%$ than participants in the low representation condition $M = 22.5\%, SD = 13.7\%$. Although no other main effects were significant, $p > .35$, a marginally significant participant gender by female representation interaction, $F(1, 238) = 4.31, p = .072$, suggested that this simple main effect of representation was somewhat larger for female participants, $d = -1.47, d.CI[-1.84, -1.10]$) than for male participants, $d = -1.00, d.CI[-1.42, -0.58])$.

There was also an unexpected significant interaction between participant gender and the manipulation of gender inclusive policies, $F(1, 238) = 9.85, p < .01$. Men recalled a higher percentage of female engineers in the low as compared to high gender inclusive policy condition $t(238)=2.63, p = .009, d = -.52, d.CI[-.92, -.13]$. Women, in contrast, tended to recall a higher percentage of women in the high as compared to low gender inclusive policy condition, $t(238)=1.75, p = .081, d = .29, d.CI[-.04, .61]$. Because this effect was unexpected and this measure came at the very end of the study, I hesitate to draw conclusions about it. Furthermore, as our primary predictions concern effects of these manipulations on women (who are perhaps simply showing more attention to this variation), these significant differences among male participants are less problematic for testing our core hypotheses.

3.3.2.1.1 **Anticipated Social Identity Threat.**

 Having established that the manipulations had the desired effect (albeit with a few more complexities than anticipated), I moved on to testing my primary hypothesis: that cues to an
inclusive culture would predict variation in social identity threat among women and not men. To test the effect of these experimental manipulations on social identity threat, I conducted a 2(female representation: high vs. low) x 2(gender inclusive policies: high vs. low) x 2(gender: male vs. female) ANCOVA on anticipated social identity threat, controlling for stigma consciousness (a significant covariate, p<.001). This analysis revealed main effects of gender, $F(1, 237) = 47.85, p < .001$, and gender inclusive policies, $F(1,237) = 5.12, p = .025$, that were qualified by a significant three-way interaction, $F(1, 237) = 5.30, p = .022$ (see Figure 3-1).

![Figure 3-1. Mean anticipated social identity threat (adjusted for stigma consciousness) for male and female participants in each of the experimental conditions in study 1. Error bars represent 95% confidence intervals.](image)

For female participants, there were significant simple main effects of gender inclusive policies, $t(237) = 2.11, p = .036$, $d = -.35$, $d.CI[-.67, -.02]$ and female representation, $t(237) = 3.20, p < .001$, $d = -.53$, $d.CI[-.86, -.19]$, but a non-significant interaction between the two, $t(237)$
As hypothesized, women anticipated less social identity threat in a company with more rather than fewer gender inclusive policies \( (M_{\text{high}} = 3.89, SD = 1.34; M_{\text{low}} = 4.30, SD = 1.39) \) and in a company with more rather than fewer women \( (M_{\text{high}} = 3.78, SD = 1.35; M_{\text{low}} = 4.41, SD = 1.35) \).

In contrast, among men, there was a significant main effect of female representation, \( t(237) = -1.19, p = .233, d = -.24, d.CI[-.62, .15] \), that was qualified by an interaction with gender inclusive policies, \( t(237) = 2.06, p = .041 \). Although men’s ratings of social identity threat were generally quite low compared to women’s, men anticipated being more aware of their gender in a company with a higher number of gender inclusive policies and a high number of women \( (M = 3.34, SD = 1.31) \) as compared to a low number of women \( (M = 2.27, SD = 1.31) \), \( t(237) = 3.13, p < .01, d = .89, d.CI[.30, 1.47] \). When the company had few gender inclusive policies, the representation of women had no effect on men’s anticipated social identity threat \( (high representation, M = 3.13, SD = 1.08 low representation, M = 3.06, SD = 1.46), t(237) = .21, p = .830, d = .06, d.CI[-.50, .62] \).

Another way to examine this three-way interaction is to ask whether gender inclusive cues ever eliminate the gender difference in anticipated social identity threat? Indeed, only when viewing a company with more women and more gender inclusive policies did women report similar levels of anticipated social identity threat \( (M = 3.46) \) as did men \( (M = 3.34), t(237) = .40, p = .687, d = .10, d.CI[-.38, .58] \). In all other conditions, the gender difference was significant, (even controlling for stigma consciousness), \( ps < .01, ds > 1.15 \). This result is consistent with the idea that for women, the presence of gender inclusive cues can be distinctly effective at reducing anticipated social identity threat.
3.3.2.2 Study 2

The question addressed in Study 2 is whether cues to a gender inclusive culture predict lower levels of social identity threat, especially for women (as compared to men). It’s important to note first that a preliminary set of t-tests revealed no significant gender differences on the estimated percentage of female engineers ($M_{men} = 16.17$, $SD = 13.01$, $M_{women} = 19.79$, $SD = 12.51$) and the number of gender inclusive policies and norms ($M_{men} = 9.52$ $SD = 3.01$; $M_{women} = 8.79$, $SD = 3.10$).

Before testing my primary hypothesis, I examined possible dependencies in the data due to the fact that some participants worked for the same companies (for 50% of the sample, only 1 person came from a given company, but for the other half of the sample, between 2 and 12 participants were recruited from the same company). Looking first at our predictors, there was a significant amount of between-company variation in cues to an inclusive culture (number of gender inclusive policies: $\sigma^2 = 5.92$, $p < .05$; percentage of female engineers: $\sigma^2 = 156.81$, $p < .05$) and a high degree of company-level dependency in these cues (number of gender inclusive policies: $\rho = .56$, $p < .001$; percentage of female engineers: $\rho = .78$, $p < .001$). These analyses confirm that cultural variability in the dataset exists on these organizational cues and that there was high agreement between participants in how they view their organization. However, there was no significant between-company or within-company dependencies for either the intercepts or the slopes of our outcome variables. Because of the lack of dependencies on dependent variables, the analyses reported below do not model variation at the organizational level (Kreft & Leeuw, 1998). However, when such models do include company-level variation, none of the conclusions are changed.
3.3.2.2.1 Predicting Social Identity Threat

To test my primary hypothesis, I used a multilevel model to assess the predictive effect of these cues to an inclusive culture on daily social identity threat. I first tested a model (Model 1a) including grand mean centered workplace policies, grand mean centered percentage of female engineers, participant gender (female = 0; male =1), and all two-way as well as the 3-way interaction terms entered as level 2 variables into a multi-level model predicting daily social identity threat. However, because power was constrained for testing several interactions together in the full model, I also ran two separate models to test whether either inclusive policies (Model 1b) or female prevalence (Model 1c) independently moderate the gender difference in social identity threat.

Results from the first model (1a) revealed no significant interactions between any of the variables (ps >.10) However, in model 1b there was marginal interaction between participant gender and gender inclusive polices, $b = 0.15, CI[-0.02, 0.32], Z = 1.73, p = .087$, such that women showed a significant relationship between gender inclusive polices and identity threat, $b = -0.18, CI[-0.30, -0.07], Z = -3.13, p = .002$, whereas men did not, $b = -0.03, CI[-0.16, 0.10], Z = -0.47, p = .641$. It is important to note that in both models there is a significant main effect of gender inclusive policies such that men and women reported less daily social identity threat when they also worked in a company with a high number of gender inclusive policies, $b = -0.10, CI[-0.19, -0.01], Z = -2.11, p = .035$.

For female representation, tested in model 1c, there was no evidence of moderation by gender, $b = 0.02, CI[-0.02, 0.06], Z = 0.83, p = .407$; women showed only a marginal relationship between female representation and social identity, $b = -0.03, CI[-0.06, 0.00], Z = -1.81, p = .073$, and men showed no relationship between the two variables, $b = -0.01, CI[-0.04, 0.02], Z = -0.57$. 

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\( p = .569 \). Note that the marginal relationship between female representation and identity threat for female participants did not remain significant when controlling for stigma consciousness, \( b = -0.01, CI[-0.04, 0.02], Z = -0.88, p = .382 \), but the relationship between policies and identity threat for women did remain significant when including this covariate, \( b = -0.12, CI[-0.23, -0.01], Z = -2.11, p = .038 \).

Thus, in Study 2, I found marginal support for the hypothesis that organizational cues predict lower social identity threat for women. Gender inclusive workplace policies might be a more important cue for reducing social identity threat. To get a sense of which policies were most strongly related to daily social identity threat, I computed the bivariate correlations between the presence of an individual policy and mean level social identity threat for male and female participants (see Table 3-2). Examining Table 3-2 suggests that, for women, many of the policies with the strongest relationship with identity threat are those that target the interpersonal and physical dynamics of the workplace. This is consistent with past work showing the physical and interpersonal cues in a setting can reduce the experience of identity threat for women in STEM (Murphy & Taylor, 2012)

For both organizational cues, although the relationship was significant and in the predicted direction when tested specifically among women (and non-significant for men), the overall interaction with gender as a moderator was non-significant. This could be due to the lack of power introduced by testing interactions between level 2 predictors in a multi-level model (Mathieu, Aguinis, Culpepper, & Chen, 2012). This limitation will be addressed in study 3.
Table 3-2 Bivariate correlations between social identity threat and the individual items included in the gender inclusive policies and practices measure. The p values for female participants were used to order the items from most significant to least significant. NAs indicate lack of variability on a given item.

<table>
<thead>
<tr>
<th>Item</th>
<th>r – female ps</th>
<th>p – female ps</th>
<th>r – male ps</th>
<th>p – male ps</th>
</tr>
</thead>
<tbody>
<tr>
<td>...physical working conditions (equipment, clothing, shower, and toilet facilities) appropriate for men and women.</td>
<td>-0.50</td>
<td>&lt; .001</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>...conditions (work schedules, job titles, physical environment) that are inclusive of both men and women.</td>
<td>-0.42</td>
<td>&lt; .001</td>
<td>-0.03</td>
<td>.486</td>
</tr>
<tr>
<td>...supervisors support both men and women equally.</td>
<td>-0.40</td>
<td>&lt; .001</td>
<td>-0.05</td>
<td>.316</td>
</tr>
<tr>
<td>...cultural norms and values that support positive working relations between men and women.</td>
<td>-0.36</td>
<td>&lt; .001</td>
<td>0.17</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>...recruitment and business advertisements showcase gender diversity</td>
<td>-0.34</td>
<td>&lt; .001</td>
<td>-0.11</td>
<td>.021</td>
</tr>
<tr>
<td>...emphasis on reducing sources of unnecessary stress such as harassment and work-family conflict.</td>
<td>-0.26</td>
<td>&lt; .001</td>
<td>0.04</td>
<td>.417</td>
</tr>
<tr>
<td>...critical mass of women, usually 30 per cent or more throughout the organization.</td>
<td>-0.22</td>
<td>&lt; .001</td>
<td>-0.08</td>
<td>.082</td>
</tr>
<tr>
<td>...language that is gender neutral</td>
<td>-0.20</td>
<td>&lt; .001</td>
<td>-0.16</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>...access to education and training opportunities for both genders.</td>
<td>-0.17</td>
<td>&lt; .001</td>
<td>0.13</td>
<td>.006</td>
</tr>
<tr>
<td>...Diversity Management program that includes policies/procedures about gender?</td>
<td>-0.16</td>
<td>&lt; .001</td>
<td>0.02</td>
<td>.621</td>
</tr>
<tr>
<td>Item</td>
<td>$r$ – female ps</td>
<td>$p$ – female ps</td>
<td>$r$ – male ps</td>
<td>$p$ – male ps</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>...family friendly work policies and there is no stigma associated in using these policies.</td>
<td>-0.16</td>
<td>&lt; .001</td>
<td>-0.10</td>
<td>.030</td>
</tr>
<tr>
<td>...statements about equal opportunity in their job postings.</td>
<td>0.13</td>
<td>.002</td>
<td>0.03</td>
<td>.504</td>
</tr>
<tr>
<td>...specify an inclusive workplace culture as part of its mission or value statements.</td>
<td>0.11</td>
<td>.011</td>
<td>-0.37</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>...employees rewarded for demonstrating these values at work, and held accountable when they act against them.</td>
<td>0.07</td>
<td>.128</td>
<td>0.04</td>
<td>.391</td>
</tr>
<tr>
<td>...formal workplace harassment policy, and all employees receive training on the policy.</td>
<td>0.03</td>
<td>.541</td>
<td>0.04</td>
<td>.403</td>
</tr>
</tbody>
</table>

### 3.3.2.3 Study 3

In Study 3 I test the same hypothesis: do gender inclusive organizational cues moderate women’s day-to-day experience of social identity threat. I first tested whether there were gender differences on the organizational variables of interest. These analyses revealed a different pattern of results to Study 1, in that men reported marginally higher estimates for female representation ($M = 26.29$, $SD = 11.46$) than did women ($M = 23.44$, $SD = 12.40$), $b = 2.85$, $t(261) = 1.92$, $p = .057$, and men also reported significantly higher counts for the number of gender inclusive policies ($M = 10.18$ $SD = 2.34$) than did women ($M = 9.18$, $SD = 2.72$), $b = 1.00$, $t(267) = 3.19$, $p = .002$.

Next, I tested for the level of dependencies in the data. Like study 1, there was a significant amount of between-company variation in cues to an inclusive culture (number of gender inclusive policies: $\sigma^2 = 2.08$, $p < .05$; percentage of female engineers: $\sigma^2 = 74.46$, $p < .05$).
and a high degree of company-level dependency in these cues (number of gender inclusive policies: $\rho = .47, p < .001$; percentage of female engineers: $\rho = .41, p < .001$), but the company level variability in the outcome variables was non-significant. Because of the lack of dependency at the level of outcomes variables, I chose not to let slopes and intercepts in our models vary between companies; however, modeling company level variation does not change any of the conclusion reported here.

### 3.3.2.3.1 Predicting Social Identity Threat

I tested my primary hypothesis that gender inclusive cultural cues would moderate women’s day-to-day experience of social identity threat by fitting a model in which I considered participant gender, female representation, gender inclusive policies, and the two-way interactions as predictors of social identity threat. This model revealed no suggestion that gender moderated the relationship of social identity threat with either of the gender inclusive cues (gender*gender inclusive policies: $b = -0.01, CI[-0.13, 0.10], Z = -0.24, p = .814$; gender * female representation: $b = 0.01, CI[-0.02, 0.03], Z = 0.69, p = .488$). An exploratory examination of the simple slopes revealed that gender inclusive policies was related to lower social identity threat for both men ($b = -0.10, CI[-0.19, 0.02], Z = -2.33, p = .021$) and women ($b = -0.09, CI[-0.16, -0.02], Z = -2.61, p = .010$), whereas female representation showed no relationship for men or women, $ps>.3$.

Given that gender did not moderate effects, I estimated the main effects of inclusive policies on social identity threat by fitting a new model where I controlled for participant gender (coded as -1/1) and examined the main effects of gender inclusive policies and representation on social identity threat. This model revealed an significant main effect of gender policies ($b = -0.10, CI[-0.15, -0.04], Z = -3.48, p < .001$) and no effect of female representation ($b = 0.00, CI[-0.01, 0.02], Z = 0.67, p = .500$).
In study 3, with a larger sample, I found evidence that gender inclusive policy predicted lower identity threat for both men and women. Like in study 2, I wanted to get a sense of which gender inclusive policies and practices were most strongly related to daily social identity threat. The bivariate correlations between the individual scale items and main level social identity threat can be found in Table 3-3. In this sample, it appears that, while policies and practices designed to establish positive interpersonal dynamics were important (e.g. cultural norms and values that support positive working relations between men and women), training programs targeted at ensuring the advancement of women were also related to women’s experience of social identity threat.

**Table 3-3 Bivariate correlations between social identity threat and the individual items included in the gender inclusive policies and practices measure. The p values for female participants were used to order the items from most significant to least significant. NAs indicate a lack of variability on a given item.**

<table>
<thead>
<tr>
<th>Item</th>
<th>r – female ps</th>
<th>p – female ps</th>
<th>r – male ps</th>
<th>p – male ps</th>
</tr>
</thead>
<tbody>
<tr>
<td>...career planning programs to retain and promote women as well as men in the organization.</td>
<td>-0.27</td>
<td>&lt; .001</td>
<td>-0.06</td>
<td>.537</td>
</tr>
<tr>
<td>...cultural norms and values that support positive working relations between men and women.</td>
<td>-0.25</td>
<td>.003</td>
<td>-0.37</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>...training programs and activities to both men and women that provide equal opportunity for career advancement.</td>
<td>-0.24</td>
<td>.004</td>
<td>-0.22</td>
<td>.015</td>
</tr>
<tr>
<td>...telecommuting policies/practices (i.e., allowing employees to working from home an</td>
<td>-0.20</td>
<td>.014</td>
<td>-0.01</td>
<td>.934</td>
</tr>
<tr>
<td>Item</td>
<td>$r$ – female ps</td>
<td>$p$ – female ps</td>
<td>$r$ – male ps</td>
<td>$p$ – male ps</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>...physical working conditions appropriate for men and women.</td>
<td>-0.16</td>
<td>.054</td>
<td>-0.14</td>
<td>.118</td>
</tr>
<tr>
<td>...all employees receive training on the workplace harassment policy.</td>
<td>-0.17</td>
<td>.056</td>
<td>-0.06</td>
<td>.552</td>
</tr>
<tr>
<td>...a fund from which employees can draw to pay for various costs such as child or family care.</td>
<td>0.15</td>
<td>.076</td>
<td>-0.01</td>
<td>.913</td>
</tr>
<tr>
<td>...benchmarking surveys to measure whether people feel that they are promoted based on merit.</td>
<td>-0.10</td>
<td>.207</td>
<td>-0.05</td>
<td>.569</td>
</tr>
<tr>
<td>...mentorship programs that give equal and unbiased access to female and male engineers.</td>
<td>-0.10</td>
<td>.208</td>
<td>-0.02</td>
<td>.840</td>
</tr>
<tr>
<td>...formal workplace harassment policy.</td>
<td>0.09</td>
<td>.282</td>
<td>0.01</td>
<td>.913</td>
</tr>
<tr>
<td>...Flextime policies (i.e., work scheduling flexibility around the start and end time...</td>
<td>-0.09</td>
<td>.290</td>
<td>-0.07</td>
<td>.466</td>
</tr>
<tr>
<td>...compressed work-week policies (i.e., full-time hours are worked in fewer than five...</td>
<td>-0.02</td>
<td>.806</td>
<td>-0.08</td>
<td>.402</td>
</tr>
<tr>
<td>...recruitment and business advertisements that showcase gender diversity</td>
<td>-0.02</td>
<td>.832</td>
<td>-0.19</td>
<td>.033</td>
</tr>
<tr>
<td>...company conducts diversity awareness training.</td>
<td>0.01</td>
<td>.894</td>
<td>-0.01</td>
<td>.902</td>
</tr>
</tbody>
</table>
### Summary

Across the three studies I found some support for my hypothesis that gender inclusive cues can mitigate women’s experience or anticipation of social identity threat. In the first study, it seems that female engineering undergraduates anticipate that both policies and representation will be important for mitigating the experience of identity threat. However, with a sample of professional working engineers, I found more support for the importance of perceiving a workplace as having gender inclusive policies, rather than a higher percentage of women, in mitigating the experience of social identity threat. Although I didn’t find consistent evidence of moderation by gender in the two samples of professional engineers, the simple slopes for the relationship between policies and identity threat for female participants was consistently significant. It is also promising that in the larger sample (Study 3), I found evidence suggesting both men and women who perceive their workplace as having gender inclusive policies report feeling less aware of their gender on a day to day basis. This point will be discussed further in the discussion.
3.3.3 Q2: Do Gender Inclusive Policies Predict More Positive Conversations?

3.3.3.1 Analytic Strategy

In the previous section I found that, across the three studies, only policies showed a consistent relationship predicting lower social identity threat for women. Thus, in this section, I focus specifically on testing the hypothesis that gender inclusive policies predicted greater conversational positivity among women in their work-related conversations with men. I also test whether this same relationship exists among men. Since female representation did not consistently predict social identity threat in Studies 2 and 3, it will only be included as a covariate in subsequent analysis.

3.3.3.2 Study 1

To test whether gender inclusive policies predict participants’ expectations about their conversations with work colleagues, I conducted a 2(gender inclusive polices: high vs. low) x 2(gender: male vs. female) ANCOVA on anticipated feelings of acceptance and competence, controlling for female representation and stigma consciousness (a significant covariate, $p = .003$). This analysis revealed a marginal main effect of gender, $F(1,240)=2.90, p = .090$, that was qualified by a significant interaction between gender and the manipulation of gender inclusive policies, $F(1,237) = 4.70, p = .031$. More importantly and consistent with hypotheses, simple effects analyses revealed that women anticipated having more positive conversations with colleagues at a company with more $(M = 5.04, SD = 0.82)$ rather than fewer gender inclusive policies $(M = 4.63, SD = 0.99)$, $t(240)$= 2.65, $p = .009$, $d = .44$, $d.CI[.11, .77]$). In contrast, gender inclusive policies had no effect on men’s anticipated conversations (high inclusive policies, $M = 5.02, SD = 1.05$; low inclusive policies, $M = 5.12, SD = 1.03$), $t(240) = -0.65, p = .546$, $d = -.13$, $d.CI[-.51, .26]$). Examined in terms of gender differences, only when exposed to a company with
a high number of gender inclusive policies did women expect to feel as accepted and competent in conversations as their male counterparts, $t(240) = .22, p = .822, d = -.01, d.CI[-.36, .35]^3$. These finding are summarized in Figure 3-2.

The same analytic strategy was used to establish whether the presence of gender inclusive cues impacted participants’ ratings of anticipated conversation hostility. This model revealed no significant main effect of stigma consciousness ($p < .027$) and no other significant effects or interactions $ps > .25$.

![Figure 3-2 Mean anticipated positivity of conversations as a function of the number of gender inclusive policies and participant gender in study 1.](image)

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^3 I conducted a 2(female representation: high vs. low) x 2(gender inclusive polices: high vs. low) x 2(gender: male vs. female) ANCOVA on anticipated feelings of acceptance and competence, controlling for stigma consciousness, and this analysis revealed that female representation did not significantly interact with any of the other variables in the model.
3.3.3.3 Study 2

If it is indeed the case that gender inclusive policies create a more positive workplace culture, then the presence of policies might predict less social identity threat because workplace interactions signal greater acceptance and competence, especially for women in their interactions with men. To examine this question, I tested whether gender inclusive policies predict the positivity of workplace conservations for women and/or for men, while controlling for female representation. I also examined if these effects differ depending on the gender of the conversation partner (which varied within-participants), given my earlier findings that women in this same sample are especially likely to experience social identity threat on days they have negative conversations with their male, but not female colleagues.

This model revealed a significant two-way interaction between partner gender and inclusive policies ($b = 0.09$, $CI[0.04, 0.13]$, $Z = 3.63$, $p < .001$), that was qualified by a significant three-way interaction between policy, participant gender, and partner, $b = -0.07$, $CI[-0.14, -0.01]$, $Z = -2.02$, $p = .044$ (see Table 3-4 for main effects and simple slopes from full model). Simple slopes (see Figure 3-3) showed that women who perceived their company as having a higher number of gender inclusive policies also reported having more positive conversations with their male colleagues ($b = 0.10$, $CI[0.16, 0.05]$, $Z = 3.81$, $p < .001$), but not with their female colleagues ($b = 0.02$, $CI[0.08, -0.05]$, $Z = 0.52$, $p = .606$), where conversations were generally positive overall. This pattern of results shows that for women, conversations with male and female coworkers are reported as being equally positive when in a gender inclusive culture ($b = 0.03$, $CI[0.17, 0.23]$, $Z = 0.27$, $p = .787$). However, when women report working for a company with a low number of gender inclusive policies, their conversations with other women remain positive but conversations with men are reported as more negative ($b = -0.48$, $CI[-0.66, -
0.31], Z = -5.32, p = < .001; policy*conversation partner gender interaction: b = 0.09, CI[0.04, 0.13], Z = 3.63, p < .001).

Interestingly, men who reported working at a company with a high number of gender inclusive policies also reported having better conversation with male colleagues (b = 0.08, CI[0.14, 0.02], Z = 2.65, p = .008) and marginally better conversations with female colleagues (b = 0.07, CI[0.14, -0.01], Z = 1.79, p = .072). That is, among men, gender inclusive policies had a main effect relationship with conversations, (b = 0.07, CI[0.01, 0.14], Z = 2.35, p = .019), that did not interact with conversation partner gender (b = -0.01, CI[-0.03, 0.02], Z = -0.51, p = .607).

Table 3-4 Summary of the main effects and interactions for the overall model for policies predicting conversation ratings in study 2.

<table>
<thead>
<tr>
<th>Term</th>
<th>B</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>percent female engineers</td>
<td>0.00</td>
<td>0.13</td>
<td>.897</td>
</tr>
<tr>
<td>gender inclusive policy count</td>
<td>0.08</td>
<td>4.14</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>participant gender</td>
<td>-0.02</td>
<td>-0.29</td>
<td>.773</td>
</tr>
<tr>
<td>partner gender</td>
<td>0.10</td>
<td>4.01</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>participant gender * gender inclusive policy count</td>
<td>0.05</td>
<td>1.04</td>
<td>.299</td>
</tr>
<tr>
<td>participant gender * partner gender</td>
<td>0.09</td>
<td>0.92</td>
<td>.357</td>
</tr>
<tr>
<td>gender inclusive policy count * partner gender</td>
<td>0.09</td>
<td>3.63</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>participant gender * gender inclusive policy count * partner gender</td>
<td>-0.07</td>
<td>-2.02</td>
<td>.044</td>
</tr>
</tbody>
</table>
3.3.3.4 Study 3

In Study 3, I used the same analytic strategy as Study 2 to test whether women experienced more positive interactions when they perceived that they worked for a company with a high number of gender inclusive polices. I tested a model in which I considered participant gender, conversation partner gender, gender inclusive policies, and all of the two and three way interactions as predictors of feelings of acceptance during work conversations (model 1a). I repeated this analysis for hostility.

3.3.3.4.1 Predicting Acceptance in Conversations

Although, model 1a revealed no significant interactions involving gender inclusive policies (see Table 3-5 for a summary of the main effects and interactions from this model), a focused examination of the simple slopes (see Figure 3-4) suggested different patterns for male and female participants. Among women, gender inclusive policies significantly predicted greater acceptance both in conversations with men ($b = 0.06$, $CI[0.02, 0.11]$, $Z = 2.66$, $p = .008$) and
women ($b = 0.06$, $CI[0.01, 0.11]$, $Z = 2.27$, $p = .023$). However, these specific relationships were in the same direction but not significant for men (conversation with men: $b = 0.03$, $CI[-0.03, 0.08]$, $Z = 0.85$, $p = .394$; conversations with women: $b = 0.02$, $CI[-0.04, 0.08]$, $Z = 0.62$, $p = .534$). Because policy did not interact with any other variables, I tested a new model that estimated the main effect of policy; this analyses revealed that all participants reported having better work conversations with their colleagues in a company with a high number of gender inclusive policies, $b = 0.05$, $CI[0.01, 0.09]$, $Z = 2.60$, $p = .009$.

### 3.3.3.4.2 Predicting Hostility in Conversations

I next tested a model examining the relationship between gender inclusive policies and day-to-day conversation hostility (model 1b). This model revealed that, although the three-way interaction was not significant (see Table 3-5 for a summary of the main effects and interactions from this model), the relationship between gender inclusive policies and hostility was always negative for each pairing, but was only significant among female participants in their conversations with their male colleagues, $b = -0.05$, $CI[-0.09, -0.01]$, $Z = -2.25$, $p = .024$ (see Figure 3-4). Estimating the main effects of policies revealed a significant relationship between policies and hostility such that all participant reported having somewhat less hostile conversations in companies with a high number of gender inclusive policies, $b = -0.04$, $CI[-0.07, 0.01]$, $Z = -2.24$, $p = .025$.

**Table 3-5 Summary of the main effects and interactions for the overall model for policies predicting conversation ratings in study 3.**

<table>
<thead>
<tr>
<th>term</th>
<th>feelings of acceptance</th>
<th>feelings of hostility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$b$</td>
<td>$Z$</td>
</tr>
<tr>
<td>percent female engineers</td>
<td>0.00</td>
<td>0.78</td>
</tr>
<tr>
<td>participant gender</td>
<td>0.00</td>
<td>0.05</td>
</tr>
</tbody>
</table>
gender inclusive policy count  |  0.05  |  2.60  |  .009  |  -0.04  |  -2.24  |  .025  
partner gender              |  0.07  |  5.11  |  < .001|  -0.10  |  -5.35  |  < .001| 
participant gender * gender inclusive policy count | -0.04  | -0.96  |  .339  |  0.01   |  0.31   |  .757  |
participant gender * partner gender | -0.04  | -0.74  |  .457  |  -0.01  |  -0.19  |  .848  |
gender inclusive policy count * partner gender |  0.00  |  0.13  |  .899  |  -0.01  |  -0.46  |  .642  |
participant gender * gender inclusive policy count * partner gender |  0.00  |  0.16  |  .876  |  0.02   |  0.59   |  .557  |

Figure 3-4 Simple slopes for policies predicting daily conversation ratings in study 3.

3.3.3.5 Summary

Taken together, the results of these three studies provide some support for the hypothesis that gender inclusive cues are related to women anticipating or having better conversations with their male work colleagues. Each study yielded partial evidence that the perception of the presence of gender inclusive policies predicts better workplace conversations, especially for
women when talking with male colleagues. Although the higher order interactions involving participant gender, partner gender, and gender inclusive polices were not consistently significant, examining the simple slopes for the relationship between gender inclusive policies and positivity of conversations revealed that for female participants there was a consistent relationship across the three studies between perceived policies and the positivity of their workplace conversations (study 1: $b = 0.41, t(237) = 2.61, p = .01$; study 2: $b = 0.10, CI[0.16, 0.05], Z = 3.81, p < .001$; study 3: $b = 0.06, CI[0.02, 0.11], Z = 2.66, p = .008$). However, it’s important to note that the effects weren’t always specific to women’s cross-sex interactions; women reported better conversations with female colleagues when they worked in a gender inclusive company in study 3, and in studies 2 & 3 men showed a consistent positive relationship (main effect) between gender inclusive policies and conversation ratings.

3.3.4 Q3: Is the Relationship Between Gender Inclusive Cues and Social Identity Threat Explained by Positive Cross-Sex Conversations?

3.3.4.1 Analytic Strategy

Because I saw consistent evidence that women who reported working at a company with a high number of gender inclusive policies also experienced less daily social identity threat, I tested the precise prediction that policies would reduce identity threat for women via improved conversations with male colleagues. I choose to focus on conversations with male colleagues as findings from Chapter 2 showed that conversations with men where the strongest predictor of daily social identity threat for female participants, and in the previous section I found that gender inclusive policies showed a consistent relationship with conversations with men for female participants. Across all three studies I fit mediation models in which I moderated the indirect paths by gender. This allowed me to simultaneously estimate the significance of the moderated
indirect effect and the conditional indirect effects for male and female participants. For each model I expect that the indirect effect will be significant for female participants but not men, and that the moderated indirect effect should be significant.

3.3.4.2 Study 1

In Study 1, I tested whether women anticipated less social identity threat in a company with a high number of gender inclusive cues because the presence of gender inclusive cues lead women to anticipate more positive workplace interactions. To do this, I fit a path model using path analysis R package lavaan (Rosseel, 2012). I tested whether there was an indirect effect of gender inclusive policies on social identity threat through anticipated feelings of acceptance and competence during conversations (see Figure 3-5 for a diagram of the model). Path a tested the relationship between policy and anticipated conversation ratings, and path b tested whether there was a significant relationship between conversation ratings and social identity threat when controlling for the effect of the manipulation of gender inclusive policies and female representation. Both of these paths were modeled as being moderated by gender to allow for a single mediation model to simultaneously estimate the moderated indirect effect by gender as well as the conditional indirect effects for male and female participants separately. These moderated paths are also theoretically sensible. Specifically, I expected there to be a significant relationship between policies and conversations positivity (path a) and between conversations and identity threat (path b) for female participants and not male participants. Finally, path c, the relationship between policy and anticipated identity threat, was moderated by gender but also female representation because previous analyses showed that the impact of policy on anticipated identity threat changed depending on the level of female representation.
The path model revealed a significant indirect effect for female participants, $ab = -.13$, $Z = 2.28$, $p = .020$ (path $a = .43$, $Z = 2.74$, $p = .006$; path $b = -.31$, $Z = -4.13$, $p < .001$), but not for male participants, $ab = .047$, $Z = .56$, $p = .577$ (path $a = -.11$, $Z = -.56$, $p = .572$; path $b = -.44$, $Z= -3.36$, $p = .001$). To better understand this effect among women, I examined how the relationship between policies and identity threat (at different levels of female representation) was impacted by the inclusion of the mediator variable in the path model. This revealed anticipated acceptance and competence during conversations at work explained only 15% ($c = -.64$, $c’ = - .54$) of the effect of policies on SIT when female representation is high, but explained 81% ($c =-.20$, $c’ = -.04$) of the effect in SIT when female representation is low. This pattern of results suggests that women anticipate gender inclusive policies as being particularly important for improving workplace conversations and thus reducing identity threat when they expect there to be few women working at the company. However, it should be noted that, although the indirect effects were not significant for male participants, the full moderated mediation model did not yield a significant moderation of the indirect effect by participant gender ($ab = .07$, $CI[-.11, .26]$), perhaps due to a lack of statistical power.
Finally, although I had proposed that cues to inclusion might reduce social identity threat by signaling subtle signs of social acceptance and competence, it’s also possible that these cues instead signal the absence of more explicit forms of gender hostility. To test this alternative, I analyzed a parallel path model testing anticipated hostility of conversations as the mediator of the relationship between gender inclusive policies and social identity threat. This model yielded no clear support for anticipated hostility as mediator as the indirect effect was not significant for women ($ab = .11, CI[-.25, .03], p = .130$) or for men ($ab = .01, CI[-.14, .12], p = .88$). Thus, the benefits of a positive workplace culture for women were not explained by women anticipating less hostility in these settings, but were instead contingent upon the expectation of feeling more competent and accepted during work conversations.
3.3.4.3 Study 2

To test whether the positivity of workplace conversations with men is a mediator of the relationship between gender inclusive policies and women’s experience of social identity, I used a non-parametric bootstrap to establish a confidence interval around the indirect (i.e., mediated) effect of gender inclusive policies on social identity threat through positivity of conversations with male colleagues. Because I saw consistent evidence that women who reported working at a company with a high number of policies also experienced less daily social identity threat, I tested the precise prediction that policies would reduce identity threat for women via improved conversations with *male* colleagues. This model tested among women revealed a significant path between gender inclusive workplace policies and the positivity of women’s conversations with men (path a: $b = 0.11$, CI[0.08, 0.13]), a significant path between positivity of conversations with men and social identity threat, controlling for gender inclusive policies, (path b: $b = -0.37$, CI[-0.52, -0.15]), and a significant indirect effect ($ab = -0.04$, CI[-0.06, -0.02]). The same model estimated for men was non-significant ($ab = -0.00$, CI[-0.01, 0.02]), but the indirect effect for the full moderated mediation did not reach statistical significance, $Z = -0.81$, $p = .418$. Finally, the same model estimated with positivity of conversations with women as a mediator revealed a total indirect effect that was non-significant ($ab = 0.00$, CI[-0.00, 0.01]), and the same model estimated for male participants also revealed non-significant indirect effects ($ab = -0.00$, CI [-0.03, 0.02]). Thus, I found evidence that for women, the relationship between gender inclusive policies and identity threat was explained by the positivity of their daily conversation with their male colleagues; however, while the same mediation model for men was not-significant, I was unable to find support for full moderated mediation of this effect.
3.3.4.4 Study 3

The same mediation models from study 2 were also evaluated in study 3. Like study 2, I tested the hypothesis that the significant relationship between gender inclusive policies and identity threat would be mediated by the positivity of conversations with male (and not female) colleagues for female (and not male) participants. I fit two different sets models: the first two models examined feelings of acceptance during conversations with men (model 1a) and then with women (model 1b) as mediators, and the second set of models examined feelings of hostility with men (model 2a) and with women (model 2b) as mediator.

Analyses of these different models revealed a pattern of results consistent with study 2. When feelings of acceptance during work conversations with men was considered as a mediator among female participants, there was a significant path between the gender inclusive workplace policies and the positivity of conversations with men (path a: \( b = 0.06, CI[0.04, 0.06] \)), a significant path between positivity of conversations with men and social identity threat, controlling for gender inclusive policies, (path b: \( b = -0.28, CI[-0.37, -0.10] \)), and a significant indirect effect \( (ab = -0.02, CI[-0.02, -0.01]) \). The same model estimated for men revealed a non-significant indirect effect \( (ab = -0.00, CI[-0.00, 0.00]) \); however, the indirect effect testing moderated mediation was also non-significant \( (Z = 1.59, p = .117) \). Finally, the same model among women estimated with positivity of conversations with other women as a mediator revealed a total indirect effect that was non-significant \( (ab = -0.00, CI[-0.00, 0.00]) \).

Models in which conversation hostility was tested as the mediator revealed a similar pattern of results: a significant indirect effect for women when conversations with men was the mediator \( (ab = -0.01, CI[-0.01, -0.00], Z = 2.29, p = .022) \); the same model for men was not significant, \( ab = -0.00, CI[-0.00, 0.00] \), but the full moderated mediation was non-significant \( (Z \)
and finally there was a non-significant indirect effect when conversations with women was the mediator for both male and female participants ($ab = -0.00, CI[-0.00, 0.00])$, and non-significant indirect effects.

Given these results, I next examined the percentage of variance explained by acceptance and hostility. Feelings of acceptance explained about 20% of the relationship between perception of gender policy and identity threat, whereas feelings of hostility only explaining about 10% of the same relationship. Thus, for female participants, I found evidence suggesting that the relationship between gender inclusive policies is partially explained women reporting have more accepting and less hostile conversations; feelings of acceptance appears to be a more important explanatory variable than hostility.

### 3.3.4.4.1 HR Policies Predicting Identity Threat and Conversation Ratings

In a final set of analyses, I sought to test whether women’s own perceptions of gender inclusive policies uniquely predicted outcomes over and above reports of policies from HR representatives. To examine this question, I redid the mediation model that tested positivity of conversations with men as a mediator of the relationship between inclusive policies and identity threat for female participants, but this time directly compared policy reports from participants and their HR representative as simultaneous predictors. Because HR reports of female representation did not correlate with participant reports ($r = .003, p = .98$), and participant reports of female representation were not predictive in the focal mediation model, I focused on comparing reports for policies from HR and participants.

The mediation model was run on the subsample of 170 participants from whom I had HR reports of gender inclusive policies. For each path in the model, I tested the significance of gender inclusive policy counts from HR and participants when predicting identity threat (path c)
and feelings of acceptance in conversations with men (path a). Across both paths, the pattern of results was consistent: for female participants, HR reports did not significantly predict their experience of social identity threat or feelings of acceptance during conversations with men (ps > .20); however, participant reports of policy remained significant when predicting positivity of work conversations with men, $b = 0.08$, $CI[0.02, 0.14]$, $Z = 2.51$, $p = .013$, and marginal when predicting identity threat, $b = -0.09$, $CI[-0.19, 0.00]$, $Z = -1.90$, $p = .059$, and the indirect effect for participant reports of policy was also significant, $ab = -0.03$, $CI[-0.05, -0.01]$. 

There was a similar pattern of results when testing models considering conversation hostility as the mediation; none of simple slopes for HR reports of policies were significant predictors ($ps > .20$), but the relationship between participant reports of policies and conversation hostility with male colleagues trended towards significance, $b = -0.05$, $CI[-0.12, 0.01]$, $Z = -1.67$, $p = .097$, and the indirect effect for participant reports of policy was also significant, $ab = -0.01$, $CI[-0.02, -0.00]$. 

3.3.4.5 Summary

I found some support for the hypothesis that the effect of policy and social identity threat was explained by gender inclusive policies predicting more positive workplace conversations. In Study 1, the relationship between the manipulation of gender inclusive polices and social identity threat was partially explained by female participants anticipating having more positive conversations with their work colleagues. For Studies 2 and 3, when testing the precise prediction that for women, the positivity of daily work conversations would mediate the relationship between policy and identity threat, I found evidence that was consistent with mediation. In the study with the largest sample, Study 3, I found that for women, gender inclusive policies were related to increased feelings of acceptance, which explained about 20%
of the relationship the gender inclusive polices and day-to-day social identity threat. Finally, there was little evidence suggesting that HR reports of policies predicted women’s daily experience of identity threat and positivity of conversations. The lack of relationship between HR reports is contrary to my predictions, but perhaps suggests that an important point of intervention could be ensuring that gender inclusive policies are present and that employees are knowledgeable of them.
Chapter 4: Discussion

4.1 Summary of Findings and Implications

This research shows that social identity threat is experienced among professional engineers and graduate students in STEM as predicted by the nature of their workplace interactions and overarching workplace culture. My research measured within-person variation over time to assess daily cues and correlates of social identity threat as experienced in a naturalistic environment. Across three daily diary studies, results revealed that women in particular experience greater social identity threat on days when their conversations with men (but not women) were perceived to be negative. For female participants only, these daily fluctuations in social identity threat significantly predict day-to-day variability in feelings of mental burnout. These finding are consistent with other experimental evidence that cues to social identity threat promote ego-depletion (Inzlicht et al., 2011). Unfortunately, I found no evidence suggesting that the experience of workplace burnout translated into reduced working memory (Schmader et al., 2008). Thus, the present findings extend this prior laboratory evidence by showing convergent support in women’s self-reported experiences in a field-based setting, however, fail to lineup with other work showing a reduction in cognitive performance (see limitation sections for further discussion).

A second goal of my dissertation was to identify whether negative biases held by male and/or female participants who interact in dyads predict women’s experience of identity threat. Across the three studies I saw limited evidence for this hypothesis. Although there were main effects of women’s stigma consciousness predicting their daily experience of social identity threat, I found little evidence suggesting that women’s own biases made them vulnerable to the experience of social identity threat. Furthermore, I saw no evidence suggesting that men’s biases
predicted women’s experience of identity threat (see limitations section for a fuller discussion of the dyadic analyses). However, in study 2 (chapter 2), I found evidence consistent with the hypothesis that women who showed a strong tendency to associate men with engineering experienced higher levels of social identity threat. This pattern of results is consistent with past work showing that female participants with negative implicit stereotypes are more vulnerable to the experience of social identity threat (Forbes & Schmader, 2010). This finding is could be of practical importance because it suggests a possible fruitful point of intervention could be changing women’s implicit biases. However, I failed to replicate this effect in the graduate sample and thus it should be interpreted cautiously.

The third goal of my dissertation was to identify naturalistic cues in the workplace that could reduce social identity threat in STEM workplaces. Based upon past theory and research, I examined two possible contextual cues: inclusive gender policies (Purdie-Vaughns et al., 2008) and higher female representation (Inzlicht & Ben-Zeev, 2000), either of which could signal a more procedurally fair and threat-free workplace culture. The results of the present research suggest that the perceived existence of gender-inclusive organizational policies was the stronger predictor of reduced actual and anticipated social identity threat among female participants; furthermore, it’s important to note that women expected both cues to be important for reducing identity threat (chapter 3, study 1) but the present work suggests that that female representation may not matter for women actually working in a STEM setting. This finding is notable in that it implicates organizational policy as a potentially viable method to reduce social identity threat, and suggests that even when very few women are present in a company, an identity safe environment might still be fostered by establishing and promoting inclusive workplace policies.
It is important to also note that in the study with the largest sample (study 3), men reported experiencing lower daily social identity threat in companies with more gender inclusive policies. Future research should test if this replicates as it would suggest that gender inclusive policies might be a fruitful way to improve outcomes for both men and women. This result could be important because members of the majority groups can often be resistant to policy changes that they see as benefiting only a minority of employees (Thomas & Plaut, 2008). Evidence that documents the broader cultural and personal correlates of these changes might be effective in lowering this resistance.

For women, the presence of gender inclusive policies did not only directly predict lower perceptions of social identity threat, but did so by predicting more positive workplace conversations with men. Evidence for mediation among women was found both when college-aged women were anticipating working in an engineering firm and among those actually employed as professional engineers. These mediation models also held while controlling for stigma consciousness, suggesting that these effects are not due to individual differences in women’s tendency to view themselves as stigmatized. Furthermore, because conversations with women did not also mediate this relationship, it does not seem to be the case that gender inclusive policies simply foster a more positive workplace in general. Some have argued that engineering has a uniquely masculinized and competitive workplace culture, a culture that many women cite as a primary reason for leaving the profession (Fouad & Singh, 2011). The presence of these gender inclusive policies might generally signal a less competitive context that particularly influences men’s behavior in ways that benefit women.

Policies appeared to uniquely benefit women, but men, in studies 2 and 3, also reported having better daily conversations with their work colleagues when in a company with gender
inclusive policies. In study 3, where I saw evidence suggesting that policies were related to lower identity threat for men there was no suggestion of mediation via more positive interactions with work colleagues. This lack of mediation should be noted as it raises the question of how policies are reducing identity threat for men. Future, research should look to explore what factors are implicated in men’s experience of identity threat in STEM workplaces. To my knowledge this is an unexplored topic of research.

Finally, I tested whether HR reports of policies were predictive of participants’ experience of daily identity threat and conversation positivity while controlling for participants’ own reports of policies. Although, these analyses were somewhat constrained by measurement problems (see limitation section), the findings suggested that participant reports were more strongly related to women’s daily experience of identity threat and conversation positivity. These findings are consistent with work on organizational justice showing that perceived procedural justice (rather than objective justice) is much more important for predicting overall perceptions of fairness (Lind & Tyler, 1988). It also suggests a possible point of intervention: education about policies and practices might be more impactful for employee’s day-to-day experience of identity threat. Future work might look to examine the efficacy of programs designed to educate participants about the existence of gender inclusive policies and practices.

4.2 Limitations and Future Directions

While these studies make many novel practical, methodological, and theoretical advances to the literature on social identity threat, there are several limitations to the conclusions that can be drawn from these data. First, although the daily diary method provides greater ecological validity to the study, the data is still correlational and therefore it is difficult to assess directionality of the results. Findings are consistent with a social identity threat framework,
where variations in conversations themselves cue threat. However, it is also possible that on days when women become more conscious of their gender, they perceive their conversations with male colleagues to be more negative. It will be important to complement this field research with laboratory studies that experimentally manipulate the nature of conversations and examine downstream effects on women’s feelings of social identity threat and burnout.

Similarly, I interpret my findings to suggest that inclusive policies foster more positive workplace interactions with men, and thus, reduce social identity threat. It is a plausible alternative that less competitive, domineering, or sexist men are attracted to and thus self-select into those companies that have more gender inclusive policies. Notably, I did not find evidence that men who reported belonging to a more gender inclusive company were lower in ambivalent sexism (Healthy workplace sample) or implicit bias (Engendering Engineering Success sample), speaking against this alternative interpretation. However, one must keep in mind that the men in the sample are not the same men with whom women in are conversing, thus limiting any ability to use these data to conclusively rule out this alternative possibility. Additionally, the experiment in which I manipulated gender inclusive cues also provides some evidence in support of the causal direction I propose; however, it is difficult to know if anticipated identity threat and positivity of interactions actually maps on to actual experiences. In the future it will be important to complement the present work with lab studies in which inclusive cues are manipulated.

My findings shed light on workplace conversations as providing contextual cues that might either increase or inhibit social identity threat. But even if this is the true direction of causality, my research does not reveal at a more micro-level what features of these conversations cue threat. I had hoped to elucidate what was happening the conversations in two ways: 1) establish whether acceptance or hostility more strongly predicted the experience of social
identity threat, and 2) use dyadic analyses to determine whether effects were driven by men’s behavior during the conversations, or women’s interpretations, or some dynamic combination of both. In both cases I was unable to test my planned hypothesis. First, acceptance and hostility were so highly correlated that it was impossible to enter them both as simultaneous predictors of social identity threat. Second, the dyadic analyses were limited because participants rarely provided data for conversations with their matched partner.

Measuring acceptance and competence in more sensitive ways could help reduce the overlap between these two constructs. In the present research I relied upon participants to recall conversations at the end of a work day. It’s possible that participants were simply not able to recall conversations in enough detail to provide ratings of conversations that discriminated between feelings of acceptance and hostility; that is, participants may have simply been unable to report on their conversations with a degree of accuracy beyond that of an overall feeling of positivity (hence the high correlation between acceptance and hostility). To overcome this shortcoming, event sampling could be used, and participants would be asked to report on conversations and identity threat immediately after an interaction. This method might be more sensitive as participants would be relying less upon memory to make rating of conversations and thus would be able to report on the conversations in more detail.

A second approach to this problem could be to employ nonobtrusive observational techniques that measure behavioral displays of acceptance and hostility. In a lab paradigm, conversations could be video recorded and coded for behavioral cues of dominance and hostility (Anderson, Brion, Moore, & Kennedy, 2012; Dasgupta et al., 2015; Tracy & Robins, 2004) as well as acceptance behaviors (e.g. increased eye contact, head nodding, reduced physical distance; Goff, Steele, & Davies, 2008; Vorauer & Turpie, 2004). Past research has successfully
used these techniques to isolate behaviors related to dominance/hostility (Vorauer & Turpie, 2004) and acceptance (Goff et al., 2008), and thus could provide a more sensitive way to assess these two constructs.

The conclusions I could draw about how conversations contributed to social identity threat were also limited by the small amount of dyadic data. To try and overcome this limitation, I examined how partner biases related to men and women’s daily experience of identity threat and burnout but found no evidence of partner effects. The lack of partner effects could be due to conversations with the matched partner only making up a small portion of the daily interactions that were found in earlier analyses to predict fluctuation in identity threat. If I was to rerun these studies I might have changed my recruitment strategy so that instead of relying on companies to nominate dyads I instead asked participants to nominate someone of the opposite gender who they frequently interact with. This strategy might result in a number of other confounds (e.g. employees nominating friends) but could increase the incidence of reported dyad conversations (and any confounds could be statistically controlled).

Another way to get dyad data would be to conduct a lab study in which nonobtrusive observational techniques are used to isolate both implicit and explicit channels of behavior that predict these interpersonal dynamics. Participants would complete measures of implicit bias prior to having a conversation with a member of the opposite sex. This design would address concerns about the directionality of effects and would allow for the examination of dyadic analyses in which I test how implicit bias translates into identity threat for male and female participants.

The present research showed that identity threat was consistently related to self-reported burnout for female participants (a strong predictor of workplace attrition (Maslach et al., 2001), but, contrary to my initial hypotheses, I failed to find evidence that burnout translated into
reduced working memory. Past research has consistently documented that social identity threat results in impairments on cognitive and performance based tasks (Schmader, Johns, & Forbes, 2008). I suspect that the failure to find support for this hypothesis is the result of the working memory measure being completed many hours after identity threatening interactions. In past research, working memory was assessed immediately after the identity threatening event, and to my knowledge there has been no research documenting if an identity threatening experience has performance implications that last beyond the small window of time that is typically examined in a lab study with undergraduates. Perhaps if I measured working memory in the moments immediately after an identity threatening conversation I would have found the hypothesized effects. Future work could address this shortcoming by employing an event sampling procedure where participants are prompted to complete a working memory measure immediately after having a workplace conversation (e.g. Riediger et al., 2011), or a lab based study could be used where participant interact and then complete a measure a working memory measure immediately following an interaction (e.g. Richeson & Shelton, 2007). Either approach would allow me to measure working memory immediately following an identity threatening event and provide a stronger test of the hypothesized effect and replicate past research (Dardenne et al., 2007; Schmader et al., 2008). A lab based approach would also have the added benefit of being able to employ a more sensitive working memory measure (i.e. a measure with more than one item) that might be more likely to capture the hypothesized effect.

Another place where the present research diverges from past work is the use of a self-report measures of social identity threat. Social identity threat has not typically been operationalized using self-report measures (see Sherman et al., 2013 for other research relying on self-report measure of identity threat), and lab studies suggest that people are often unable
(Steele & Aronson, 1995) or unwilling (Johns, Inzlicht, & Schmader, 2008) to report on the experience of identity threat. This raises the possibility that my research is only tapping into identity threatening events that are consciously recognized while other identity threatening yet psychological impactful experiences are going unreported. Future work should look to outline the types of identity threatening experiences that are consciously recognized and how they might be distinct from identity threatening experiences that are psychologically impactful but not available to conscious awareness, or whether simply creating psychological or temporal distance from an identity threatening event allows people to more readily self-report the experience of threat.

Finally, I think that more objective data on policies and female representation in the organizations is still needed to better elucidate whether perceptions of a gender inclusive culture is more important for reducing social identity threat, rather than the actual existence of such policies and the presence of female engineers. I tried to address this shortcoming by collecting data from HR representatives in the organizations. Analyses using this measure showed no relationship between HR reports and participants day-to-day experiences. However, taking a closer look at the HR data it became clear that this measure had a number of shortcomings. Engineering participants and the HR representative from the same company often worked in different cities or provinces. This made me uncertain as to how accurately HR reports would reflect policies and practices and female representation of the offices occupied by the sample of engineers. Restricting the sample to only employees and HR representatives who came from the same location made the sample very small and not suitable for statistical tests.

The engineering participants’ reports of policies and representation might more accurately measure the gender inclusivity of their immediate workplace but are obviously flawed
in that they are subject to all of the biases associated with self-report (Nisbett & Wilson, 1977; Paulhus & Vazire, 2007). Although, it is important to note the HR reports might be equally susceptible to self-report biases in that HR employees could be motivated, maybe more so than an engineer, to present the company in a favorable light. Future work might use in-depth interviews from HR and engineers in the same office space. This technique has been used successfully in the past to examine the efficacy of inclusive workplace policies and practices (Kalev et al., 2006). Furthermore, in America, the 1964 Civil Rights Act requires employees with more than 100 employees and government contractors with more than 50 employees to file annual EEO-1 (Equal Employment Opportunity) reports that detail age, race, ethnicity, and gender of employees. Future research could use EEO-1 data paired with in-depth HR interviews to better measure gender inclusive cues and assess how they impact employees’ experience of identity threat. This could be done over a period of many years to track how the addition and/or removal of gender inclusive cues impacts men’s and women’s day-to-day workplace experience in STEM. Finally, intervention studies are needed to establish whether educating employees about the existence of gender inclusive policies can successfully change the interpersonal consequences of workplace culture over time, and stem the rates at which women leave the profession.

4.3 Broader Implications

This research makes a number of conceptual and methodological advances to the literature on social identity threat. First, it shows that social identity threat as experienced by women in STEM is not something that is unique to student populations still seeking to establish their identity in a career. Professional engineers and graduate students have presumably achieved academic success yet still report experiencing social identity threat in their daily interactions.
Although I was only able to track these experiences over 10 days, one might suspect that the cumulative effects of daily social identity threat could play a role in the higher attrition rates seen among women in engineering (Hunt, 2010; Maslach et al., 2001). Conceptually, these findings suggest that academic success or entry into a profession does not inoculate people against social identity threat. Just as highly successful African American students at elite educational institutions still faced a burden of being seen stereotypically (Steele & Aronson, 1995), professional women and graduate students in STEM continue to experience this phenomenon as well.

In addition to documenting the experience of social identity threat among a new population, here I also show that social threat can be cued in an interpersonal context. Although some prior evidence suggests that cross-sex conversations can trigger social identity-threat like processes among women in STEM (Holleran, Whitehead, Schmader, & Mehl, 2010; Logel et al., 2009), none of these past studies directly measured the concern about being evaluated based on one’s gender. The present findings show more directly that conversations with men in particular play a critical role in cuing social identity threat for women. When these conversations elicit feelings of non-acceptance, women in particular become more aware of their gender and feel more mentally burned out. The positive frame on these results is that men might play a very large role (perhaps even larger than other women) in shoring up feelings of acceptance and eliminating women’s experience of social identity threat. These findings highlight the importance of interventions that seek to promote more positive interpersonal norms in the workplace. This is especially important given the increasingly diverse workplaces (Apfelbaum et al., 2014) that often results in increased interpersonal conflict (King et al., 2009). The present research points to a possible explanation as to why diversity is not always associated with increased performance.
(Eagly, 2016) but also suggests a point of intervention to help reap the benefits associated with diversity (Page, 2008).

This research also demonstrated that the interpersonal dynamics in STEM and the experience of identity threat were predictive of women’s self-reported daily burnout. Burnout has been shown to be highly correlated with attrition (Maslach et al., 2001), and in future research it will be important to follow up with participants to see if the self-reported burn-out translates into leaving the workplace or graduate school. The accumulation of burnout overtime may not only have implications for attrition (Maslach et al., 2001) but could, much like repeated daily stressors (DeLongis, Folkman, & Lazarus, 1988), impair health and well-being. Future work will need to examine whether the repeated experience of identity threat predicts poorer health outcomes.

Finally, the biggest practical implication to these findings is the demonstration that gender inclusive policies might benefit women, not only by predicting lower levels of social identity threat but also by promoting feelings of acceptance in interactions. Such evidence might be of clear value to companies when establishing new policies not only for suggesting the benefits that such policies might have, but also in helping to advertise that those benefits to employees. Companies could make efforts to educate employees about existing gender inclusive policies and this should yield better cross-sex interactions for female employees, reduced identity threat, and lower workplace burnout. Furthermore, advertising the existence of gender inclusive policies to potential employees could be an effective way to attract women who might anticipate having more positive relationships with their male colleagues and thus be more interested in working at that company. Taken together these findings provide roadmap for a low cost educational intervention that could help attract and retain more women STEM.
4.4 Conclusions

Women leave STEM settings at a higher rate than do men (Hunt, 2010). Social identity threat is one potential explanation for the uniquely adverse experience that some women face in STEM. The present research documents that social identity threat is felt among female graduate students and professional women during conversations with their male colleagues that engender feelings of incompetence and lack of acceptance. Moreover, these experiences of social identity threat predict daily feelings of burnout. This work also offers some insight into possible points of intervention. Gender inclusive policies, and supportive workplace relationships might be an important means of fostering a more supportive interpersonal environment in which people feel mutually respected and free from concerns about gender stereotyping. It is my hope that this research will inform workplace policy designed to foster inclusive interpersonal interactions that create identity safe environments for employees and graduate students. By creating a culture of inclusivity, I believe we can recover human potential that would otherwise by lost under the weight of identity threat.
References


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Appendices

Appendix A

Appendix A contains materials related to the Healthy Workplace Study.

A.1 List of Measures

Demographics:

- Age
- Gender
- Ethnicity
- Location Home town/city/province
- Education
- Company name
- Office location
- Employment status (e.g. full time)
- Screening for ambulatory blood pressure component
- Work schedule
- Training as an engineer
- Job title
- Do you regularly interact with a male engineer
- Do you regularly interact with a female engineer.

Between Subject Measures:

- Self-efficacy
- Work stress
- Job reward
- Job support
- Family stress
- Happiness
- Life satisfaction
- Organizational-commitment
- Ten Item Personality Inventory
- Identification with Engineering
- Stereotype threat
- Health checklist
• Feeling undermined by colleagues
• Workplace gender culture
• Stigma-consciousness*
• Reasons women Leave Engineering
• Ambivalent sexism

Within Subject Measures:

• Social identity threat*
• Belonging
• Burnout*
• Happiness
• Gender of conversation partner*
• Topic of conversation*
• Ethnicity of conversation partner
• Status of conversation partner*
• Relationship with conversation partner
• Description of conversation
• Time of conversation
• Initials of conversation partner
• Frequency of conversations with partner
• Number of men in conversation
• Number of women in conversation
• Positivity of thoughts elicited by the conversation*
A.2  **Items for Conversation Measure**

1) Not Friendly/Friendly: Did you feel that the conversation was unfriendly, or friendly? (1 - Not Friendly, 7 – Friendly)

2) Not Respected/Respected: Did you feel that other people who were present did not respect your ideas, or did you feel that your ideas were respected? (1 - Not respected, 7 – Respected)

3) Not Accepted by others/Accepted by others: Did you feel that others in the conversation did not accept you, or did you feel accepted by the other people? (1 - Not Accepted by others, 7 - Accepted by others)

4) Incompetent/Competent: Did you feel did you feel that you were less competent than others in the conversation, or did you feel knowledgeable about the topic of conversation. (1 – Competent, 7 – Incompetent)

5) Not authentic/Authentic: Did you feel inauthentic, like you had to hide your true self during the conversation, or did you feel authentic (that you could be your true self)? (1 - Not authentic, 7 – Authentic)

6) Anxious/Relaxed: Did you feel tense during the conversation, or at ease? (1 – Relaxed, 7 – Anxious)

7) Not free to express ideas/Free to exchange opinions and ideas: Were you worried about how people would react to what you were saying, or did you feel comfortable telling people how you thought or felt? (1 - Free to express ideas, 7 - Not free to express ideas)

8) Distracted/Engaged: Did you feel distracted during the conversation, or were you completely engaged in what was being discussed? (1 – Distracted, 7 – Engaged)
9) Easy to follow/Hard to understand: Did you feel that the conversation was easy for you to follow and contribute to or was it one that included information, jargon, or topics that you didn't understand (1 - Easy to follow, 7 - Hard to understand)
A.3 Burnout Measure

1) After work, I needed more time to relax than usual (1=Strongly Disagree, 7=Strongly Agree).

2) Today, I spoke about my work in a derogatory way (1=Strongly Disagree, 7=Strongly Agree).

3) Today, I felt that I could stand the pressure of my work very well (1=Strongly Disagree, 7=Strongly Agree).

4) Today, I felt emotionally drained during work (1=Strongly Disagree, 7=Strongly Agree).

5) Today, I felt that I lost my internal motivation for my work (1=Strongly Disagree, 7=Strongly Agree).

6) After work, I felt worn out and weary (1=Strongly Disagree, 7=Strongly Agree).

7) I dreaded the tasks I needed to do today (1=Strongly Disagree, 7=Strongly Agree).

8) Today, I felt that I could manage the amount of work well (1=Strongly Disagree, 7=Strongly Agree).

9) Today, I enjoyed my work (1=Strongly Disagree, 7=Strongly Agree).

10) Today, I felt positively engaged in my work (1=Strongly Disagree, 7=Strongly Agree).
A.4 Stigma Consciousness Measure

Items for female participants:

1) When interacting with men, I feel like they interpret all my behaviors in terms of the fact that I am a woman (1-Strongly Disagree, 7-Strongly Agree)

2) Most men do not judge women on the basis of their gender (1-Strongly Disagree, 7-Strongly Agree)

3) My being female does not influence how men act with me. (1-Strongly Disagree, 7-Strongly Agree)

4) Most men have a problem viewing women as equals. (1-Strongly Disagree, 7-Strongly Agree)

Items for male participants:

1) When interacting with women, I feel like they interpret all my behaviors in terms of the fact that I am a man. (1-Strongly Disagree, 7-Strongly Agree)

2) Most women do not judge men on the basis of their gender (1-Strongly Disagree, 7-Strongly Agree)

3) My being male does not influence how women act with me. (1-Strongly Disagree, 7-Strongly Agree)

4) Most women have a problem viewing men as equals. (1-Strongly Disagree, 7-Strongly Agree)
A.5 Policy Measure

1) Does your organization have cultural norms and values that support positive working relations between men and women?

2) Does your organization have conditions (work schedules, job titles, physical environment) that are inclusive of both men and women?

3) Does your organization have a strong ‘critical mass’ of women, usually 30 per cent or more throughout the organization?

4) Does your organization have an emphasis on reducing sources of unnecessary stress such as harassment and work-family conflict?

5) Does your organization have language that is gender neutral; (i.e mancarrier, manpower and sexist comments are not the norm)

6) Does your organization have physical working conditions (equipment, clothing, shower, and toilet facilities) appropriate for men and women?

7) At your organization do supervisors support both men and women equally?

8) Does your organization have access to education and training opportunities for both genders?

9) Does your organization specify an inclusive workplace culture as part of its mission or value statements?

10) Are employees rewarded for demonstrating these values at work, and held accountable when they act against them?

11) At my organization there are family friendly work policies and there is no stigma associated in using these policies.

12) At my workplace we have a formal workplace harassment policy, and all employees receive training on the policy.
13) Does your organization have a Diversity Management program that includes policies/procedures about gender?

14) Does your organization include statements about equal opportunity in their job postings?

15) Does your organization’s recruitment and business advertisements showcase gender diversity (i.e., are there images of both men and women, and people of different ethnicities)?
Appendix B

Appendix B contains material related to the Engendering Engineering Success Study.

B.1 List of Measures

Demographics:

- Age
- Gender
- Ethnicity
- Location
- Home town/city/province
- Education
- Company size
- Office size
- Company name
- Office location
- Employment status (e.g. full time)
- Training as an engineer
- Job title do you regularly interact with a male engineer
- Do you regularly interact with a female engineer.

Between Subject Measures:

- Self-efficacy
- Work stress
- Family stress
- Life satisfaction
- Organizational-commitment
- Ten Item Personality Inventory
- Social Identity threat
- Feeling undermined by colleagues
- Workplace gender culture*
- Percentage of female engineers*
- Stigma-consciousness*
- Intention to leave
- Organizational fit
- Explicit association about women in engineering*
• Implicit associations about women in engineering*
• Competitiveness
• Competitive culture

Within Subject Measures:

• Social identity threat*
• Burnout*
• Gender of conversation partner*
• Topic of conversation*
• Status of conversation partner*
• Relationship with conversation partner
• Initials of conversation partner
• Positivity of thoughts elicited by the conversation*
• Hostility of the conversation
• Number of work related conversations
• Number of social conversations
• Working Memory*
• Time participant started work
• Time the participant stopped work.
B.2 Conversation Measure

1) Did you feel that the conversation was unfriendly, or friendly? (1 – Not Friendly, 7-Friendly)

2) Did you feel that other people who were present did not respect your ideas, or did you feel that your ideas were respected? (1 – Not Respected, 7- Respected)

3) Did you feel that others in the conversation did not accept you, or did you feel accepted by the other people? (1 – Not Accepted by others, 7- Accepted by others)

4) Did you feel inauthentic, like you had to hide your true self during the conversation, or did you feel authentic (that you could be your true self)? (1 – Not authentic, 7- Authentic)

5) Did you feel tense during the conversation, or at ease? (1 – Relaxed, 7- Anxious)

6) Did you feel that the person you were talking to was being intentionally argumentative or hostile, or were they pleasant and agreeable? (1 – Argumentative, 7- Agreeable)

7) Did you feel that the person you were talking to was overtly condescending, or were they polite and kind? (1 – Polite, 7- Condescending)
B.3 Burnout Measure

1) After work, I needed more time to relax than usual. (1=Strongly Disagree, 7= Strongly Agree)

2) Today, I felt that I could stand the pressure of my work very well. (1=Strongly Disagree, 7= Strongly Agree)

3) Today, I felt emotionally drained during work. (1=Strongly Disagree, 7= Strongly Agree)

4) After work, I felt worn out and weary. (1=Strongly Disagree, 7= Strongly Agree)

5) Today, I felt that I could manage the amount of work well. (1=Strongly Disagree, 7= Strongly Agree)
B.4  Overview of the Working Memory Task

1  6  +1  3  -3  -2  +8
3  8
6.5 seconds  3 seconds  3 seconds  3 seconds  3 seconds  3 seconds
B.5 Stimuli used in the Brief Implicit Associations Test

Male Names: BEN, JOHN, DANIEL, PAUL

Female Names: JULIA, MICHELLE, ANNA, EMILY

Engineering words: testing, technology, design, math

Family words: marriage, parent, children, spouse
B.6 Screenshot of Brief Implicit Associations Test

FEMALE

or

engineering

technology

Press I if the word belongs to one of the two categories, and E if not. If you make a mistake: correct it with the other key.

MALE

or

engineering

design

Press I if the word belongs to one of the two categories, and E if not. If you make a mistake: correct it with the other key.
B.7 Policy Measure

FLEXIBLE WORK PROGRAMS

1) My company has Flextime policies (i.e., work scheduling flexibility around the start and end times of the work day, though a certain number of hours per day must be worked).
2) My company has compressed work-week policies (i.e., full-time hours are worked in fewer than five days).
3) My company has telecommuting policies/practices (i.e., allowing employees to working from home and communicate with the workplace through technology, occasionally or full time).

WORK-LIFE BALANCE PROGRAMS

1) My company has on-site child care.
2) My company has a fund from which employees can draw to pay for various costs such as child or family care.
3) My company has paid parental leave (i.e., over and above basic entitlements).
4) My company has paid maternity leave (i.e., over and above basic entitlements).

PROMOTING HEALTH AND SAFETY OF EMPLOYEES

1) My company has a fund from which employees can draw to customize the ergonomics in their workspace.
2) My company has a whistleblower policy that protects employees who report health and safety violations.
3) My company offers health and wellness programs beyond basic government and extended health/dental insurance, such as an Employee Family Assistance Program, counselling, or a flexible health spending account.
4) My company offers access to health and wellness programs (eg. on-site gym, running club, or discounted fitness center membership).

RECRUITMENT, RETENTION, AND ADVANCEMENT IN ENGINEERING

1) My company offers training programs and activities to both men and women that provide equal opportunity for career advancement.

2) My company offers career planning programs to retain and promote women as well as men in the organization.

3) My company offers mentorship programs that give equal and unbiased access to female and male engineers.

4) My company conducts benchmarking surveys to measure whether people feel that they are promoted based on merit.

PROMOTING A GENDER INCLUSIVE CULTURE

1) My company has cultural norms and values that support positive working relations between men and women.

2) My company conducts diversity awareness training.

3) My company has recruitment and business advertisements that showcase gender diversity (i.e., are there images of both men and women, and people of different ethnicities)?

4) My company has physical working conditions (equipment, clothing, shower, and toilet facilities) appropriate for men and women.

5) My company has a formal workplace harassment policy.

6) At my company, all employees receive training on the workplace harassment policy.
Appendix C

Appendix C contains materials form the Graduate School Study.

C.1 List of Measures

Demographics:

- Age
- Gender
- Ethnicity
- Location
- Home town/city/province
- Education
- Graduate school size
- Lab size
- Graduate school name
- Graduate school location
- Program name
- Program Type
- Do you regularly interact with a male engineer
- Do you regularly interact with a female engineer.

Between Subject Measures:

- Self-efficacy
- Graduate school stress
- Social life stress
- Life satisfaction
- Graduate school-commitment
- Ten Item Personality Inventory
- Social Identity threat
- Feeling undermined by colleagues
- Graduate school gender culture*
- Percentage of female graduate students in program
- Percentage of female graduate students in lab*
- Stigma-consciousness*
- Intention to leave graduate school
- Fit in graduate school
• Explicit association about women in STEM
• Implicit associations about women in STEM Competitiveness Competitive culture

Within Subject Measures:

• Social identity threat*
• Burnout*
• Gender of conversation partner*
• Topic of conversation*
• Status of conversation partner*
• Relationship with conversation partner
• Initials of conversation partner
• Positivity of thoughts elicited by the conversation*
• Hostility of the conversation
• Number of work related conversations
• Number of social conversations
• Working Memory*
• Time participant started work
• Time the participant stopped work.
C.2  Burnout Measure

1) After working, I needed more time to relax than usual.

2) Today, I felt that I could stand the pressure of my work very well.

3) Today, I felt emotionally drained while working.

4) After working, I felt worn out and weary.

5) Today, I felt that I could manage the amount of work well.
C.3  Stimuli used in Brief Implicit Associations Test

Male Names: BEN, JOHN, DANIEL, PAUL

Female Names: JULIA, MICHELLE, ANNA, EMILY

STEM: ENGINEERING, PHYSICS, COMPUTER-SCIENCE, MATH

FAMILY WORDS: MARRIAGE, PARENT, CHILDREN, SPOUSE
Appendix D

Appendix D contains materials from the experiment detailed in chapter 3.

D.1 List of Measures

Demographics:

- Gender
- Age
- Year in university
- Major
- Name of university
- Engineering specialization
- Intention to pursue an engineering career

Measures:

- Interest in working at CCB
- Anticipated organizational commitment
- Anticipated self-efficacy
- Anticipated positivity of interactions*
- Anticipated competitiveness
- Ratings of fairness
- Anticipated social identity threat*
- Perceptions of status of men and women
- Anticipated Harassment
- Manipulation check
- Memory test
- Stigma consciousness*
- Ambivalent sexism.
D.2 Manipulation of Female Representation

High Female Representation Condition

Low Female Representation Condition
D.3 Manipulation of the Number of Gender Inclusive Policies

High number of gender inclusive policies

<table>
<thead>
<tr>
<th>Policy/Program</th>
<th>Present at CBC</th>
<th>% top 50 companies with policy or program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work-aligned programs</td>
<td>✓</td>
<td>66%</td>
</tr>
<tr>
<td>Supervisors accountable for providing equal support to both genders</td>
<td>✓</td>
<td>80%</td>
</tr>
<tr>
<td>Work schedules, job titles, and work conditions inclusive of both genders</td>
<td>✓</td>
<td>62%</td>
</tr>
<tr>
<td>Reimbursements for relevant classes or degree programs</td>
<td>✓</td>
<td>73%</td>
</tr>
<tr>
<td>Programs and workshops to create cultural norms for positive working relations between genders</td>
<td>✓</td>
<td>87%</td>
</tr>
<tr>
<td>Family friendly work programs (e.g., paid parental leave)</td>
<td>✓</td>
<td>77%</td>
</tr>
<tr>
<td>Equipment and facilities are gender appropriate</td>
<td>✓</td>
<td>70%</td>
</tr>
</tbody>
</table>

Low number of gender inclusive policies

<table>
<thead>
<tr>
<th>Policy/Program</th>
<th>Present at CBC</th>
<th>% top 50 companies with policy or program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has a whistleblower policy to protect employees.</td>
<td>✓</td>
<td>70%</td>
</tr>
<tr>
<td>Supervisors accountable for providing equal support to both genders</td>
<td>✓</td>
<td>80%</td>
</tr>
<tr>
<td>Provides employees with discounted fitness center memberships.</td>
<td>✓</td>
<td>62%</td>
</tr>
<tr>
<td>Family friendly work programs (e.g., paid parental leave)</td>
<td>✓</td>
<td>77%</td>
</tr>
<tr>
<td>Employees can customize the ergonomics of their workspace.</td>
<td>✓</td>
<td>87%</td>
</tr>
<tr>
<td>Reimbursements for relevant classes or degree programs</td>
<td>✓</td>
<td>73%</td>
</tr>
<tr>
<td>Has regular company retreats.</td>
<td>✓</td>
<td>66%</td>
</tr>
</tbody>
</table>
D.4 Measure of Social Identity Threat

1) If you worked at CCB, how often do you think that people would think about your gender when judging you? (1=Never, 7=Always)

2) If you worked at CCB, how often would you worry that people might judge you because of what they think of your gender? (1=Never, 7=Always)

3) If you worked at CCB, how often would you worry that people would judge your gender because of your behavior? (1=Never, 7=Always)

4) If you worked at CCB, how often would you worry about other people of your gender acting in ways that confirm gender stereotypes? (1=Never, 7=Always)
**D.5 Conversation Measures**

If you worked at CCB, how often do you think you would feel the following during your interactions with other engineers?

1) A sense of acceptance from your colleagues (1=Never, 7=Always)

2) A sense of competence in your abilities (1=Never, 7=Always)

3) A sense of hostility from your colleagues (1=Never, 7=Always)

4) A sense of conflict from your colleagues (1=Never, 7=Always)