Spring 2021

Femininity Under Threat: How Women Respond to Feedback about Their Physical Appearance

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Abstract

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2021

In recent decades, it has become increasingly normative—at times, even desirable—for women to possess traditionally masculine personality traits. The pressure on women to maintain a feminine physical appearance, however, has not waned. Past research has demonstrated that unlike men, women do not experience distress when their psychological gender stereotypicality has been threatened. This does not mean, however, that they are immune from the harms of gender stereotypicality threats altogether. In this dissertation, I explore the possibility that women experience distress when their *physical* femininity has been threatened.

In *Chapter 1*, I lay the foundation for my empirical work. I provide an overview of the constructs at the center of this dissertation: gender stereotypes, gender identity, gender stereotypicality threats, and identity invalidation. Further, I highlight three major gaps in the existing literature on gender stereotypicality threats: attention to women, consideration of physical appearances, and exploration of underlying mechanisms.

In Chapter 2, I present four studies that test my hypothesis that physical femininity threats are distressing for women. I find that women experience anxiety and reduced self-esteem in response to information indicating that their appearance is less feminine than average (versus more feminine than average). Further, I find that these effects are not simply the result of women interpreting this information to mean they are unattractive. I also find that these effects are indeed domain specific, such that physical, but not psychological,

threats produce anxiety and reduced self-esteem in women. In men, in contrast, masculinity threats produce anxiety across domains. Finally, I find preliminary evidence that identity invalidation—and specifically, a discrepancy between the feedback one received and one's internal sense of self—can help to explain the effects of gender stereotypicality threats on both anxiety and self-esteem.

In Chapter 3, I describe the unique contributions of these studies to the psychology of gender and propose three directions for future research. I suggest that additional studies be conducted to explore the null effects of psychological femininity threats. Additionally, I propose that future research approach the subject of femininity threats from an intersectional perspective, considering whether and how experiences with these threats differ between dominant and minoritized social group members. Finally, I highlight the importance of considering the broader consequences of femininity threats, both for women who have been threatened and for people in general.

In sum, this dissertation explores a highly consequential phenomenon that has been largely overlooked in the literature: femininity threats. In doing so, it highlights unique ways in which gender stereotypes can harm women and paves the way for further research on this phenomenon, as well as interventions to mitigate its harm.

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A Dissertation
Presented to the Faculty of the Graduate School
Of
Yale University
in Candidacy for the Degree of
Doctor of Philosophy

by
Natalie Markowitz Wittlin

Dissertation Director: Marianne LaFrance

June 2021

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Acknowledgments

This dissertation was supported, in part, by an American Psychological Association Dissertation Research Award and a Society for the Psychological Study of Social Issues Grant-in-Aid.

I could not have completed this dissertation without the support of mentors, colleagues, friends, and family who believed in me, lifted me up, and encouraged me along the way.

To begin, I would like to thank Marianne LaFrance. Thank you for seeing potential in me, for valuing my interests and experiences, and for admitting me to this program. I will always be grateful to you for this opportunity. Thank you, also, for always challenging me—to justify my hypotheses, to clarify my constructs, to define my terms, and to express myself confidently. When I was struggling to write you taught me to approach the process "bird by bird," and when I wrote too much, you reminded me of the importance of editing ("If I had more time, it would have been shorter"). When I write now, I ask myself if you would find my language sufficiently clear, my constructs sufficiently grounded in the literature, and my explanations sufficiently compelling. If the answers to these questions are yes, I know I am on the right track. I am a better scientist and stronger writer for having worked with you.

Next, I would like to thank John (Jack) Dovidio. Thank you for showing me that there is always a way forward, no matter how challenging a research question or personal obstacle may seem. Whenever I came to a meeting with you feeling stressed and overwhelmed, I left feeling relieved, clear in my purpose, and ready to work. Thank you for always meeting me where I was and helping me to make my work stronger without judgment or evaluation. You have provided me, and countless others, with concrete and memorable

guidance that I have already passed on to many undergraduate students and that I know I will continue to pass on throughout my career. Perhaps most importantly, you taught me that writing is a skill, not a talent, and that even the most prolific researchers can struggle with it. Thank you for always making time for me, for bringing me on to research projects, and for modeling kindness and generosity within the often cold and competitive world of academia.

I would also like to thank Jennifer (Jenn) Richeson. Thank you for welcoming me into your lab and academic family without hesitation and for providing me with consistent guidance and support over the last few years. You had confidence in me when I doubted myself, you created structure and accountability when I needed it most, and you showed me how to conduct rigorous psychological research in the service of social justice. Thank you for allowing me to bring my full self to my work and for pushing me to connect my research to both foundational psychological theories and relevant current events. Your feedback on my theme essay, prospectus, and dissertation was invaluable. Finally, thank you for chairing my dissertation committee. This process is a challenging one, and I am grateful for all you have done to help me through it. You are truly goodness and light.

Additionally, I would like to thank Michael Kraus and Jutta Joormann for their feedback on this dissertation. Both of you provided comments that not only strengthened this document but that will also strengthen my research in the years to come. Michael: Thank you, also, for supporting me—in lab meetings, on Slack, and on Twitter—and for being such a vocal advocate for equity and justice in our field.

I would also like to thank all of the research assistants who I have had the pleasure of working with over the past six years: Valerie Akinyoyenu; Aishwarya (Aish) Bhattacharya; Andre Faria; Alexia Fite; Sidney (Sid) Hirschman; Suyeon (Sue) Hong; Alejandro (Alex) Jaco;

Eun Kwak; Joy Lian; Caroline Moore; Zoey Peterson; Katelyn (Katie) Reese; Jasmine Rios; and Hannah Weisman. You have all made essential contributions to my research and have taught me, inspired me, and given me hope for the future.

A big thanks is due to the many other members of the Yale Psychology Department who have provided me with support over the past six years. Thank you to the current and former members of the Gender Lab, the Intergroup Relations Lab, and the Social Perception and Communication Lab. I am so grateful to have been able to learn from and with all of you, as well as to have shared an office space with so many of you over the past six years. You filled my days (and sometimes nights) with good conversation, humor, community, and friendship. Special thanks to Sara Burke, Ivuoma (Ivy) Onyeador, and April Bailey for being not only friends and cheerleaders but also mentors and role models. A big thanks, as well, to my cohort, to Bud (Lambert) Cinemas, and to my WhatsApp group. Thank you to Krystal Augustine, Lynn Butler, Andrea Chamba, Patricia (Patty) McClure, Lauretta Olivi, James (Jim) Westgate, and all of the other department staff who made taking classes, attending lectures, TAing courses, and conducting research at Yale a smooth and seamless experience.

I would also like to acknowledge all of the hard, and often unrecognized, labor that so many of my colleagues and friends have put into efforts to make the department, the university, and the field of psychology more equitable, inclusive, and just. In particular, I would like to acknowledge the work of the current and former leaders and members of the Committee on Diversity and Inclusiveness, the Committee on Racial Equity and Justice, and the Psych Collective, as well as the Department's Graduate Student Assembly representatives.

Finally, I would like to thank my family—both the family I was fortunate enough to be born into and the family I've built. You have celebrated my accomplishments, been there for me during the most difficult of times, and surrounded me with love. Thank you to my friends, particularly Marissa Branson, Louise Enten, Matthew (Matt) Lebowitz, and Jeremy Steinemann, for your endless support. To my sister, Maggie Wittlin: Thank you for understanding me, empathizing with me, responding to my texts at all hours of the day, and being my ultimate confidant. To my partner, Ashleigh Rutherford: Thank you for keeping me grounded, providing me with strength and comfort, listening to me nonjudgmentally, and being there for me every step of the way. To my mom, Paula Markowitz Wittlin: You are my role model and my rock. Thank you for teaching me to stand up and speak out for what I believe in, for loving and supporting me unconditionally, and for truly going to the ends of the earth for me. I never could have made it to this point without you. Finally, to my dad, Floyd Wittlin z"l: It is still hard to believe that you're not here to see me finish this six-year journey, but I know you never doubted I would make it here. Thank you for always having confidence in me, even when I thought it was unfounded, for teaching me to stay true to my values, and perhaps most relevantly, for teaching me to write.

Chapter 1: Introduction

In 1985, Anne Hopkins sued the accounting firm Price Waterhouse, her former employer, for denying her partnership. Partners at the firm had referred to Hopkins as "macho" and had suggested that she might be considered for promotion if she were to "walk more femininely, talk more femininely, dress more femininely, wear make-up, have her hair styled, and wear jewelry" (Fiske et al., 1991, p. 1117; Price Waterhouse v. Hopkins, 1989). Hopkins argued, and with input from prominent social psychologists, the U.S. Supreme Court agreed that this denial constituted sex discrimination, as it was driven by Hopkins' non-adherence to gender stereotypes. Although this landmark Supreme Court decision occurred over thirty years ago, if women in the twenty-first century are to be liked and considered adequately feminine, they are still expected to maintain a feminine physical appearance. Indeed, in 2019, media reports revealed that Ernst & Young, another large accounting firm, had held a workshop in which female employees were encouraged to come to work with a "good haircut, manicured nails, and well-cut attire that complements [their] body type" (Peck, 2019). Furthermore, since Price Waterhouse v. Hopkins, other courts have ruled that employers can legally fire female employees for not adhering to gender-specific dress and grooming codes that require them to wear their hair down, style it, and wear makeup (Jespersen v. Harrah's Operating Co., 2002). Despite women's increased presence in traditionally masculine spheres and roles (England et al., 2020; Geiger & Parker, 2018; Parker et al., 2017), the mandate for women to appear hegemonically physically feminine—that is, in accordance with Eurocentric conceptualizations of femininity (Collins, 2004), to have light, smooth, and hairless skin, a slim build, long, silky hair, and a youthful appearance—has clearly persisted. As a consequence of this mandate, women who do not live up to—or who believe they do not live up—these standards of physical femininity may experience acute psychological distress.

In this dissertation, I examine psychological consequences of threats to women's physical femininity. In this introductory chapter, I provide a brief overview of the psychological constructs that are central to this dissertation: gender stereotypes, gender identity, gender stereotypicality threats, and identity invalidation. I also highlight areas in need of reconsideration and additional attention. Further, I make the case that research on gender stereotypicality threats has been limited by its inattention to women, to physical appearances, and to the mechanisms by which these threats translate into psychological distress. I assert that a comprehensive understanding of the consequences of gender stereotypicality threats requires attention to all three.

At times, different bodies of literature use different terms to describe related or even identical constructs and phenomena. Likewise, different literatures sometimes use the *same* term to describe constructs and phenomena that are theoretically distinct from one another. Thus, to limit confusion and ensure conceptual clarity throughout this dissertation, in this chapter, I indicate which terms I will be using and describe how they overlap with and differ from similar and related terms. An overview of all of the terms defined in this chapter is presented in Table 1.2. This table is meant to serve as a reference should readers wish to refer back to the definitions provided in this chapter.

Gender Stereotypes

The studies presented in this dissertation examine psychological responses to feedback about one's gender stereotypicality. Here, I situate these studies within current understandings of gender stereotypes and describe one important limitation of the existing literature on this topic: inattention to physical appearances.

Defining Gender Stereotypes

The term *gender stereotypes* refers, broadly, to people's beliefs about the attributes of females and males[1,2] (Ashmore & Del Boca, 1979, 1981; Prentice & Carranza, 2002; Rosenkrantz et al., 1968). It does not, however, refer to people's *definitions* of what it means to be female or male, which tend to refer to genitals and/or chromosomes (Schudson et al., 2019). Although stereotypes are often described as expectations about members of a group (Swim & Hyers, 2009. p. 411), it is perhaps more accurate to describe them as beliefs about groups that *inform* expectations about individual members of those groups (Dovidio et al., 2010).

Gender stereotypes comprise not only *descriptive* elements—that is, beliefs about what women (and girls) and men (and boys) *are* like—but also *injunctive* elements—that is, beliefs about what women and men *should* be like (in the case of *prescriptive* stereotypes) and *should not* be like (in the case of *proscriptive* stereotypes) (e.g., Burgess & Borgida, 1999; Heilman, 2001; Eagly & Karau, 2002; Fiske & Stevens, 1993; Prentice & Carranza, 2002). Descriptive and injunctive stereotypes are largely but not entirely overlapping (Koenig, 2019; Prentice & Carranza, 2002).

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[1] Although many psychologists reserve the terms "female" and "male" for references to biological sex (Muehlenhard & Peterson, 2011), in this dissertation I use them to refer to gender. In doing so, I ensure inclusivity of individuals who identify as "women," "men," "girls," "boys," and "guys," which is particularly important when studying young women, who may identify as "girls" (Chrisler, 2013). Accordingly, I use the terms "female" and "male" not only as adjectives (as in "female participants" and "male participants") but also as nouns (American Psychological Association, 2020). This decision has precedent in the literature (Hyde, 2005).

[2] The term *gender stereotypes* could theoretically refer to beliefs about cisgender women/girls, cisgender men/boys, transgender women/girls, transgender men/boys, and nonbinary individuals. It is typically used more narrowly, however, to refer to beliefs about cisgender women/girls and cisgender men/boys.

When discussing gender stereotypes throughout this dissertation, I use the terms *feminine* and *femininity* to refer to characteristics that are descriptively and/or prescriptively stereotypical of women (and which are also often self-reported by women more than men; Bem, 1974; Spence et al., 1975). Correspondingly, I use the terms *masculine* and *masculinity* to refer to characteristics that are stereotypical of men (and which are also often self-reported by men more than women; Bem, 1974; Spence et al., 1975). These definitions align with Bem's (1974) description of feminine characteristics as those "judged to be more desirable [in American society][3] for a woman than a man" and masculine characteristics as those "judged to be more desirable in American society for a man than for a woman" (pp. 155-156). Understandings of the terms *feminine* and *masculine* vary considerably, however, among lay people (Schudson et al., 2019) and psychologists (Constantinople, 1973; Spence, 1984) alike. As Spence (1984) explains, they can be used in (a) the "empirical" sense—as labels for characteristics associated with and prescribed for members of one gender group or the other (p. 66) or (b) the "theoretical" sense—to refer to a perhaps undefinable, "fundamental property or aspect of the individual's self-concept that is not directly observable" (p. 90). When using these terms in the context of gender stereotypes, I use them in the empirical sense.

Descriptive (though not necessarily prescriptive) gender stereotypes are often conceptualized as inherently comparative (Prentice & Carranza, 2002). In other words, characteristics are classified as feminine if women are thought to possess them at higher rates than men, whereas they are classified as masculine if men are thought to possess them at higher rates than women (Prentice & Carranza, 2002). Notably, however, generic beliefs

[3] The empirical research presented in this dissertation was indeed conducted in—and primarily informed by other research conducted in—the United States.

(e.g., "Men are intelligent," "Women are emotional") seem to be more central than statistical beliefs (e.g., "Men are more likely than women to be intelligent") to the cognitive structure of descriptive stereotypes, as they are more predictive of expectations about individual women and men (Hammond & Cimpian, 2017). Therefore, women being more likely than men to report a particular characteristic (e.g., Bem, 1974; Spence et al., 1975) is *not* an indication that the stereotype that women possess that characteristic is accurate (since stereotypes are largely cognitively represented as "women possess this characteristic" rather than "women are more likely than men to possess this characteristic"). It is also not an indication that the belief that women possess that characteristic is not a stereotype (Swim, 1994). This point is important in the context of the research presented in this dissertation, which focuses on physical gender stereotypes, because some would likely argue that women and men indeed look different from one another. Average differences between women and men on a particular characteristic, however, do not prevent that characteristic from being a stereotype.

Descriptive gender stereotypes are also largely bipolar (Biernat, 1991; Foushee et al., 1979; Spence, 1984); in other words, adults tend to conceptualize femininity and masculinity as two ends of a single spectrum—or, in other words, as polar opposites. As described in Chapter 2, the manipulations used in this dissertation capitalize on this lay understanding of femininity and masculinity.

Distinguishing Gender Stereotypes

The term *gender stereotypes* is closely related to several other terms, including *gender prototypes*, *sex* (or *gender*) *roles*, *gender norms*, and *sex-typed characteristics*. Each of these terms, however, has a slightly different meaning. To clarify the logic behind my decision to frame

this dissertation in terms of *stereotypes*, here, I define each of these terms and distinguish it from *gender stereotypes*.

Gender prototypes refers to mental representations of highly typical or representative instances of a gender category (Brewer et al., 1981; Helgeson, 1994; Smith & Zarate, 1990). Whereas prototypicality can be thought of as existing along a single dimension, degree of prototypicality, stereotypicality can be thought of as existing along two dimensions, degree and *direction* of stereotypicality. For example, if being kind is part of what it means to be a prototypical woman, then both unusually kind and unusually unkind women are non-prototypical. If being kind is part of what it means to be a *stereotypical* woman, on the other hand, then unusually kind women are highly stereotypical, whereas unusually unkind women are counter-stereotypical. Because in this dissertation I am interested in comparing women's responses to feedback indicating that they are high in femininity (and low in masculinity) versus high in masculinity (and low in femininity), I frame this work in terms of gender stereotypes, rather than prototypes.

The term *social roles* is typically used to refer to sets of shared expectations about people with a specific social position or in a specific social category (Eagly & Karau, 2002; Gouldner, 1957). Examples of social roles include friend, parent, co-worker, boss, teacher, lawyer, construction worker, and nurse. *Sex* (or *gender*) roles are specific types of social roles thought to stem from women's and men's uneven occupation of other social roles (Eagly & Karau, 2002). More specifically, a sex (or gender) role refers to the *collection* of stereotypes associated with one gender or the other (Eagly & Karau, 2002). Putting effort into one's appearance, for example, is a gender stereotype and constitutes one *element* of the female gender role; it does not, however, constitute the female gender role in its entirety (Broverman et al., 1972; Prentice & Carranza, 2002).

The term *social norms* refers to "rules and standards that are understood by members of a group, and that guide and/or constrain social behavior without the force of laws" (Cialdini & Trost, 1998, p. 152). Both the term *gender stereotypes* and the term *gender norms* have been used to refer to both descriptive and prescriptive beliefs about women, men, girls, and boys; thus, they can be considered synonymous and used interchangeably (Diekman & Goodfriend, 2006). In the context of gender norms, however, the term *normative* is sometimes used to refer exclusively to *prescriptive* stereotypes (Eagly, 1987, p. 13). Additionally, in line with the above definition of *social norms*, the term *gender norms* could be understood to refer specifically to behaviors and not to other components of gender stereotypes. Therefore, in this dissertation, I refrain from using this term.

Finally, the term *sex-typed* has several different meanings: (a) prescriptively stereotypical of one gender group or the other (as in "sex-typed norms" or "sex-typed standards;" Wood et al., 1997); (b) possessing characteristics that are prescriptively stereotypical of one's gender group and *not* possessing characteristics that are prescriptively stereotypical of the *other* primary gender group (as in "sex-typed women" and "sex-typed men;" Bem, 1974; Spence & Helmreich, 1980); and (c) aligned with a particular gender identity, a term that will be discussed below (as in "sex-typed behaviors;" Bailey & Zucker, 1995). Therefore, although in some cases the terms *sex-typed* and *stereotypical* can be used interchangeably (e.g., communality is a sex-typed trait or a trait that is stereotypical of women), to avoid any confusion, throughout this dissertation, I solely use the term *stereotypical*.

Gender Stereotypes and Physical Appearance

Research on gender stereotypes has been limited by its prioritization of certain domains. It has focused largely on personality traits—with competence, agency, and

instrumentality constituting masculine stereotypes and warmth, expressiveness, and communality constituting feminine stereotypes (Broverman et al., 1972; Rosenkrantz et al., 1968; Heilman, 2001, 2012), as well as on cognitive ability—with math ability constituting a masculine stereotype and verbal ability constituting a feminine stereotype (Cejka & Eagly, 1999; Eccles et al., 1990; Nosek et al., 2009). Gender stereotypes, however, are multidimensional and include not only beliefs about people's psychological traits but also beliefs about their physical appearances (Cejka & Eagly, 1999; Deaux & Lewis, 1983, 1984; Helgeson, 1994; Kagan, 1964). Indeed, women and men are thought to be more *physically* than *psychologically* different (Deaux & Lewis, 1984). And in studies on lay understandings of femininity and masculinity, physical attributes are often mentioned more frequently than personality traits, cognitive abilities, roles, speech, movement, and behavior (Myers & Gonda, 1982; Spence & Sawin, 1985; but see Helgeson, 1994).

The inattention to physical appearance in research on gender stereotypes may have led researchers to overlook important consequences of these stereotypes—especially for women. Evidence suggests that physical appearances are more central to conceptualizations of femininity in women than masculinity in men. In one study, for example, in which participants were asked what characteristics come to mind when they think of a "very feminine woman" or "very masculine man," descriptions of feminine women included a greater proportion of physical descriptors than descriptions of masculine men did (Spence & Sawin, 1985). When asked about a feminine woman, 54% of women and 45% of men mentioned physical attributes. When asked about a masculine man, on the other hand, only 37% of women and 29% of men mentioned physical attributes. Similarly, when participants in another study were asked which characteristics they associate with being a feminine female, nearly half of the descriptors used referred to "physical attributes and mannerisms"

(Aube et al., 1995). When asked which characteristics they associate with being a masculine female (38%), masculine male (34%), or feminine male (41%), however, participants included fewer physical descriptors and instead focused more on personality traits, role behaviors (i.e., activities within the family and the home), and interests. Results from one study deviated from this pattern, finding that physical appearance is more central to how people think about *masculinity* in women than femininity in men and women and masculinity in men (Helgeson, 1994). Still, this study is consistent with the others in that participants mentioned appearances more when describing stereotypicality (or rather *counter*-stereotypicality) in women than stereotypicality in men.

The frequent neglect of physical appearance in research on gender stereotypes might help to explain why psychologists have generally concluded that women are given more leeway to be masculine than men are given to be feminine (Kimmel, 2004, p. 147-148; Thompson & Pleck, 1986). It indeed seems to be the case that within the domains of personality traits, role behaviors, and occupations, counter-stereotypicality is judged more harshly in males than it is in females (Feinman, 1981; Koenig, 2019; Martin, 1990; McCreary, 1994; Sirin et al., 2004)—or, in other words, that whereas men and boys are subjected to a clear and pervasive anti-femininity mandate, women and girls are not subjected to a comparable anti-masculinity mandate. And this asymmetry may exist at least in part because masculinity is more highly valued and higher-status than femininity is (Feinman, 1981; Parker et al., 2017). Within the domain of physical appearance, however, counter-stereotypicality may *not* be judged more harshly in males than it is in females. In fact, physical stereotypicality may be particularly prized and counter-stereotypicality particularly discouraged in women.

Although research on gender stereotypes has often overlooked physical appearances, when appearances *have* been attended to, the focus has typically been on psychological or

behavioral *investment* in appearances, rather than appearances themselves. For example, in their studies of prescriptive gender stereotypes, Prentice and Carranza (2002) found that paying attention to one's appearances is generally considered desirable but that it is considered more desirable for women than people in general and less desirable for men than people in general. Additionally, research has suggested that physical *attractiveness* may constitute a particularly strong prescription for women. In a 2017 nationally representative survey of U.S. adults, for example, participants were asked "what traits society values most in men and women" (Parker et al., 2017). In reference to women, the plurality of responses (35%) focused on what the authors classified as physical attractiveness, whereas in reference to men, the plurality (33%) focused on honesty and morality. Furthermore, 71% of participants said that women face a lot of pressure to be physically attractive, whereas only 27% said that men face such pressure.

The large overlap between that which is considered physically attractive in women and that which is considered physically feminine (Keating, 1985; Penton-Voak et al., 2004; Rhodes et al., 2000; Rhodes et al., 2003) suggests that physically feminine features (e.g., hairless skin, an unpronounced brow ridge and jawline, and large lips; Rhodes, 2006) are highly prescribed for women. Indeed, the most common "beautification" practices in which women engage—eyebrow shaping, body and facial hair removal, use of anti-aging creams, and application of eye and lip makeup—increase physical femininity and reduce physical masculinity (Russell, 2010). The apparent emphasis on physical stereotypicality in women may help to explain why even though women, but not men, are increasingly identifying with counter-stereotypical personality traits and decreasingly identifying with stereotypical personality traits (Donnelly & Twenge, 2017; Twenge, 1997), women report that it is very important for them to be viewed as "womanly or feminine" to a greater extent than men

report that it is very important for them to be viewed as "manly or masculine" (20% versus 9%; Parker et al., 2017).

A full understanding of the consequences of prescriptive gender stereotypes requires consideration of the pressure on women to appear physically feminine—and in particular, on what happens when women believe they have failed to live up to ideals of physical femininity. This question is the focus on the studies presented in Chapter 2. Furthermore, an understanding of what happens in these instances requires consideration of the extent to which women experience threats to their gender stereotypicality as threats to their identity. In the next section of this chapter, I therefore provide a brief introduction to the psychological construct of gender identity and clarify how I will use this term throughout the remainder of the dissertation.

Gender Identity

In Chapter 2 of this dissertation, I examine the relationship between feedback about one's gender stereotypicality and beliefs about one's identity. In particular, I investigate the effect of this feedback on both the strength of one's gender identity and the sense that one's identity is being denied. Here, I lay out existing understandings of the construct of gender identity, clarify how I will use this term throughout the dissertation, and describe the relationship between gender identity and physical appearance.

Defining Gender Identity

In its broadest sense, *gender identity* refers to "the quality and strength of the cognitive connections...that a person makes between the self and a gender category" (Tobin et al., 2010). Definitions and understandings of this term, however, vary (Wood & Eagly, 2015). *Gender identity* has been used to refer, in whole or in part, to all of the following:

i. children's "membership knowledge"—or awareness of the gender category to which they belong by virtue of their genitals and thus assigned sex (Bussey & Bandura, 1999; Egan & Perry, 2001; Kohlberg, 1966, p. 103; Tobin et al., 2010)

ii. identification with a gender category, often determined by an alignment between one's internal sense of self and an individual understanding of what membership in that category entails (i.e., *self-categorization*; Factor & Rothblum, 2008; Kuper et al., 2012; Spence, 1993; Spence & Sawin, 1985; Tate, 2014; Tate et al., 2014);

iii. identification with other people of one's gender group (Becker & Wagner, 2009; Gurin & Townsend, 1986);

iv. centrality of gender membership to one's overall sense of self (Ashmore et al., 2004; Becker & Wagner, 2009; Gurin & Townsend, 1986; Tobin et al., 2010) (i.e., *gender identity centrality*; Rogers et al., 2015 or *gender identification*; Schmader, 2002);

v. felt pressure (internal and/or external) to conform to gender stereotypes (Egan & Perry, 2001; Tobin et al., 2010; Witt & Wood, 2010);

vi. self-perceived gender typicality, or adherence to gender stereotypes (Gurin & Townsend, 1986; Tobin et al., 2010; Martin et al., 2017; Witt & Wood, 2010; in the tradition of Bem, 1974 and Spence et al., 1974, 1975);

vii. identification with femininity and/or masculinity, determined by an alignment between one's internal sense of self and one's individual understanding of these constructs (Constantinople, 1973; Oswald &

Lindstedt, 2006; Spence, 1984; Spence, 1993; Spence & Buckner, 2000; Spence & Sawin, 1985).

Whereas the first three conceptualizations of gender identity refer to identification as female or male, the latter three refer to identification as feminine or masculine. Throughout this dissertation, I therefore use the term *gender identity* to refer to a two-dimensional construct consisting of: (a) one's internal sense of femaleness or maleness; and (b) one's internal sense of femininity and masculinity.[4] Here, following the final conceptualization of gender identity listed above, I use the terms *femininity* and *masculinity* in the "theoretical," rather than the "empirical" sense (Spence, 1984)—that is, to refer to an element of one's sense of self that is "incapable of being put into words" (Spence, 1984, p. 80) and whose meaning can vary from person to person.

Although identification with a gender category is frequently operationalized as a categorical variable (with individuals identifying as *either* female *or* male *or* nonbinary, etc.), in this dissertation I operationalize it as a *continuous* variable representing the *degree* of one's internal identification with a gender category. This operationalization allows for differentiation among individuals with a shared gender self-categorization (Tate, 2014), as well as potential contextual malleability—or, in this dissertation, the ability to shift in response to feedback about one's gender stereotypicality. This operationalization is also consistent with research that assesses gender identity using an implicit association task (Ashmore et al., 2004; Olson et al., 2015). I similarly operationalize identification with femininity and masculinity as continuous variables (Wood & Eagly, 2009).

[4] When assessing participants' gender category membership at the beginning of the empirical studies, however, I ask them to report their "gender identity" as female, male, nonbinary, or "other," in line with a basic self-categorization approach to measuring gender identity.

The two dimensions of gender identity described above may, in fact, be redundant with one another in cisgender individuals (that is, individuals who identify with the sex assigned to them at birth). It may also be the case that when asked about their internal sense of femaleness, maleness, femininity, and masculinity, cisgender women and men understand the former two terms as referring to their fundamental self-concept and the latter two as referring to their adherence to gender stereotypes. However, cisgender individuals' interpretation of these terms—and the extent to which they overlap—likely vary from person to person. Thus, when assessing gender identity, I ask participants to report on *both* their internal femaleness (or maleness) *and* their internal femininity and masculinity. Furthermore, I intentionally avoid defining *female*, *male*, *femininity*, and *masculinity* for participants and remain agnostic as to their interpretations of these terms. This approach is consistent with theorizing that understands *gender identity* to represent "a sense of belonging to an abstract category of persons in the world irrespective of social similarities to them that is likely difficult to articulate" (Tate et al., 2014).

Gender Identity and Physical Appearance

Although physical appearance is a key component of gender *stereotypes* (Deaux & Lewis, 1984) and femininity in particular (Parker et al., 2017; Spence & Sawin, 1985), its relevance to gender *identity* is less clear—and thus explored in Chapter 2. In their study that demonstrated that physical attributes are central to descriptive gender stereotypes—and femininity in particular—Spence and Sawin (1985) found that such attributes are actually *not* particularly central to gender *identities*. In this study, participants were asked, "When you think in terms of being a woman (man) and your own femininity (masculinity), what defines your womanhood (manhood) as far as your own self-image is concerned?" The plurality of male participants (26%) spontaneously mentioned their role as a provider, whereas only 5%

spontaneously mentioned physical attributes. A near majority of female participants (46.5%) spontaneously mentioned their role as a wife or mother, whereas only 8% spontaneously mentioned physical attributes. However, the participants in this study were members of married couples with young children and therefore might have been more focused on family roles than the average woman or man would have been. Similarly, in their study of the relationship between participants' physical attributes, as coded by an outside observer, and gender identity, Aube and colleagues' (1995) found that gender identity was not associated with physical femininity among women. It *was*, however, associated with physical masculinity among men, such that those who identified as more masculine were also rated as more physically masculine (according to physical gender stereotypes). Together, the results from these two studies suggest that physical appearance may be more central to stereotypes about women than women's gender identities.

Not all studies, however, have suggested that this discrepancy exists. Twenge (1999) asked women and men to self-report on their personality traits, occupational interests, interest in sports, femininity of physical appearance, number of friends of each gender, number of sex partners, attitudes towards women and feminism, and finally, femininity and masculinity (each measured using a single item). They found that among women, the measure most closely related to global femininity, other than global masculinity (which was negatively correlated with femininity), was "feminine-valued appearance behaviors," which consisted of "spending time on appearance, wearing perfume or cologne, having long hair, owning a large number of shoes, wearing jewelry, and wearing earrings in both ears."

If physical appearances are central to women's gender identities, as Twenge's (1999) work suggests, information suggesting that a woman is not physically feminine might influence her overall sense of self. If, on the other hand, physical appearances are central to

gender stereotypicality—especially femininity—but *not* women's gender identities, as Spence and Sawin's (1985) and Aube and colleagues' (1995) work suggests, women might experience information suggesting that they are not physically feminine as discordant with their internal sense of self—particularly if they identify as highly globally feminine. In other words, women might experience physical gender stereotypicality threats as a form of identity invalidation. This possibility, and these key constructs, are discussed in more depth in the following section.

Gender Stereotypicality Threats and Identity Invalidation

Chapter 2 of this dissertation examines the consequences of gender stereotypicality threats for women. Here, I describe how this research fills gaps in the literature on both the negative consequences of gender stereotypes for women and the psychological effects of gender stereotypicality threats.

How Gender Stereotypes Harm Women

Gender stereotypes can harm women through their effects on both others' impressions of women and women's impressions of themselves. They can also be harmful both when women are thought to *possess* stereotypical characteristics (and/or lack counter-stereotypical characteristics) and when they are thought to *lack* stereotypical characteristics (and/or possess counter-stereotypical characteristics). In other words, the types of situations in which gender stereotypes harm women can be divided into four categories (see Table 1.1):

(a) situations in which others believe a woman possesses stereotypical characteristics (and/or lacks counter-stereotypical characteristics);

(b) situations in which others believe a woman lacks stereotypical characteristics (and/or possesses counter-stereotypical characteristics);

(c) situations in which a woman believes she possesses stereotypical characteristics (and/or lacks counter-stereotypical characteristics); and

(d) situations in which a woman believes she lacks stereotypical characteristics (and/or possesses counter-stereotypical characteristics).

Whereas situations (a) and (c) result from descriptive stereotypes (which inform perceptions of women), situations (b) and (d) result from prescriptive stereotypes (which inform evaluations of women).

Table 1.1
Situations in which stereotypes harm women

	Stereotype-congruent impressions	**Stereotype-incongruent impressions**
External (Others' impressions of women)	(a) Lack of fit / role incongruity (Eagly & Karau, 2002; Heilman, 1983)	(b) Backlash (Eagly & Karau, 2002; Rudman & Glick, 2001)
Internal (Women's impressions of themselves)	(c) Stereotype threat (Spencer et al., 1999)	(d) Femininity threat (Dissertation)

A great deal of research has examined the first three types of situations. When women are assumed to possess stereotypical characteristics and/or lack counter-stereotypical characteristics—particularly in the workplace—they are often seen as "lacking fit" with the positions they seek and therefore denied career advancement opportunities (Eagly & Karau, 2002; Heilman, 1983). When women are thought to *lack* stereotypical characteristics and/or possess counter-stereotypical characteristics, they often experience *backlash*, which similarly limits the likelihood that they will be hired or promoted (Eagly & Karau, 2002; Rudman & Glick, 2001). Finally, when women attempt to perform well in a domain in which they are stereotyped as untalented (e.g., math), they often experience *stereotype threat*—or a concern that they will confirm this negative stereotype, which can lead to underperformance (Spencer

et al., 1999). Minimal research, however, has examined the final category: situations in which women believe they lack stereotypical characteristics and/or possess counter-stereotypical characteristics. Chapter 2 of this dissertation begins to fill this gap in the literature by examining women's psychological responses to this type of situation.

Gender Stereotypicality Threats

Situations that suggest that a person does not possess characteristics that are expected of members of their gender group and instead possesses characteristics that are expected of members of the other primary gender group have been referred to as *gender identity threats*[5] (Sinclair & Carlsson, 2013; Willer et al., 2013), *gender role threats* (Bosson et al., 2009), and *[gender] prototypicality threats* (Alonso, 2018; Maass et al., 2003; Schmitt & Branscombe, 2001). In this dissertation, however, I refer to them as *gender stereotypicality threats*. I opt not to use the term *gender identity threats* in the context of my research because, as discussed later in this section, a threat to one's gender *stereotypicality* may—but does not necessarily—serve as a threat to one's gender *identity*. And indeed, determining whether gender stereotypicality threats affect identity is one aim of this dissertation. Additionally, I opt not to use the term *gender role threats* because, as discussed earlier, physical appearances may or may not constitute an element of gender roles and certainly do not constitute the entirety of these roles. Finally, I opt not to use the term *[gender] prototypicality threats* because in

[5] Note that the term *threat* has at times been used to refer to the stress, anxiety, fear, and/or discomfort that may *result* from particular situations, in which case these situations may be referred to as threat *inductions*, rather than as *threats* (Branscombe et al., 1999). The term has also been used to refer to situations with which people do not believe they have the necessary resources to cope (Mendes et al., 2002). Here, however, I use it simply to refer to situations that *may* produce stress, anxiety, fear, and/or discomfort and with which people *may* or may *not* believe they have the necessary resources to cope.

these studies, all participants receive feedback indicating that they are atypical—but that they are atypical in either a stereotypical or counter-stereotypical direction.

There is no perfect term to describe these sorts of threats. In most studies that explore this phenomenon, participants are informed that there is some dimension on which women and men differ. They are then told that their score on an assessment of that dimension is either more gender-congruent (in the affirmation condition) or less gender-congruent (in the threat condition) than the average person in their gender group. In other words, in the affirmation condition, they are told that they are more different from gender outgroup members than most gender ingroup members are. In the threat condition, they are told that they are more similar to gender outgroup members than most gender ingroup members are. (See Figures 1.1 and 1.2 for examples from the studies reported in this dissertation.)

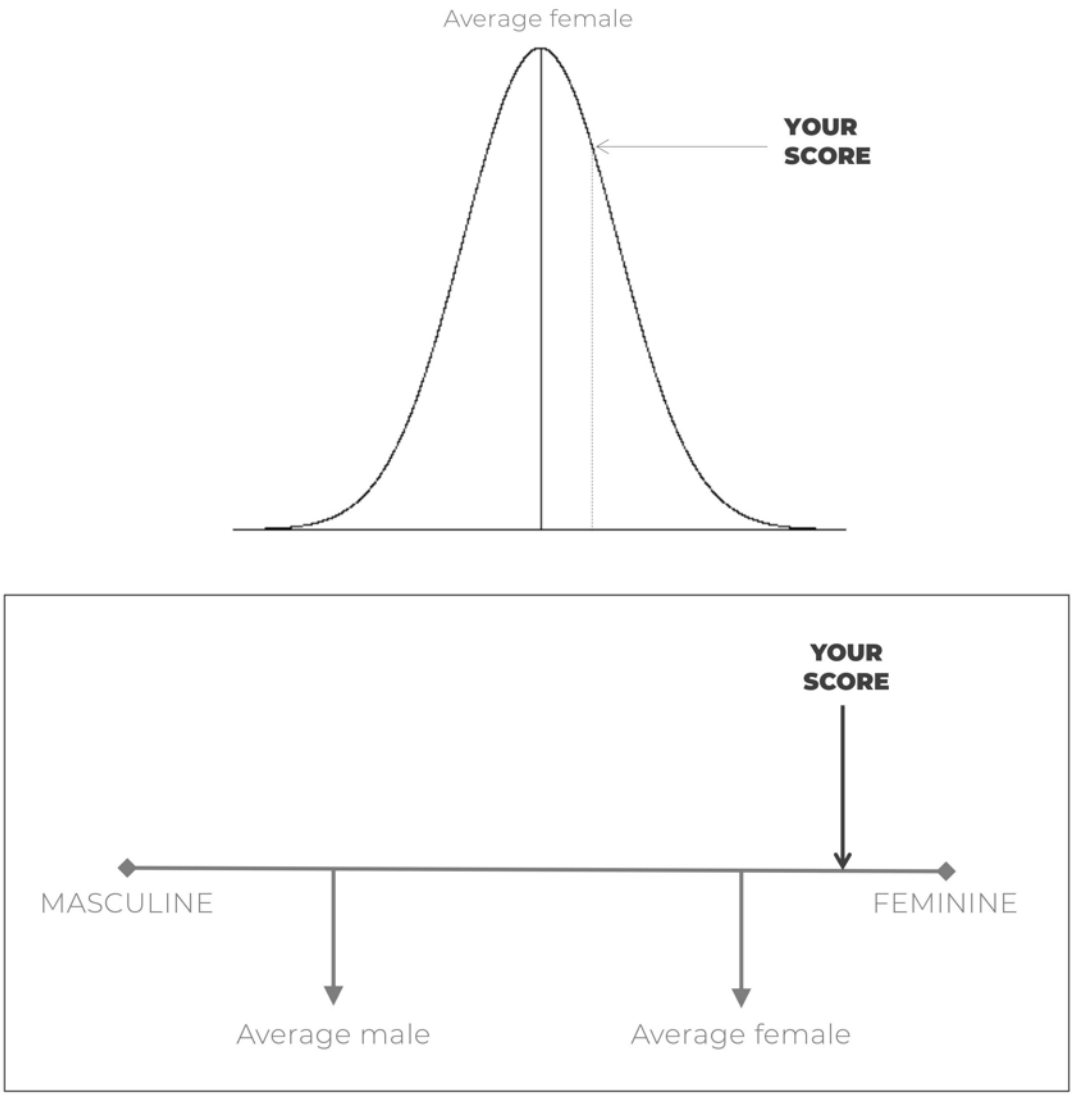

Figure 1.1. Example of affirming feedback

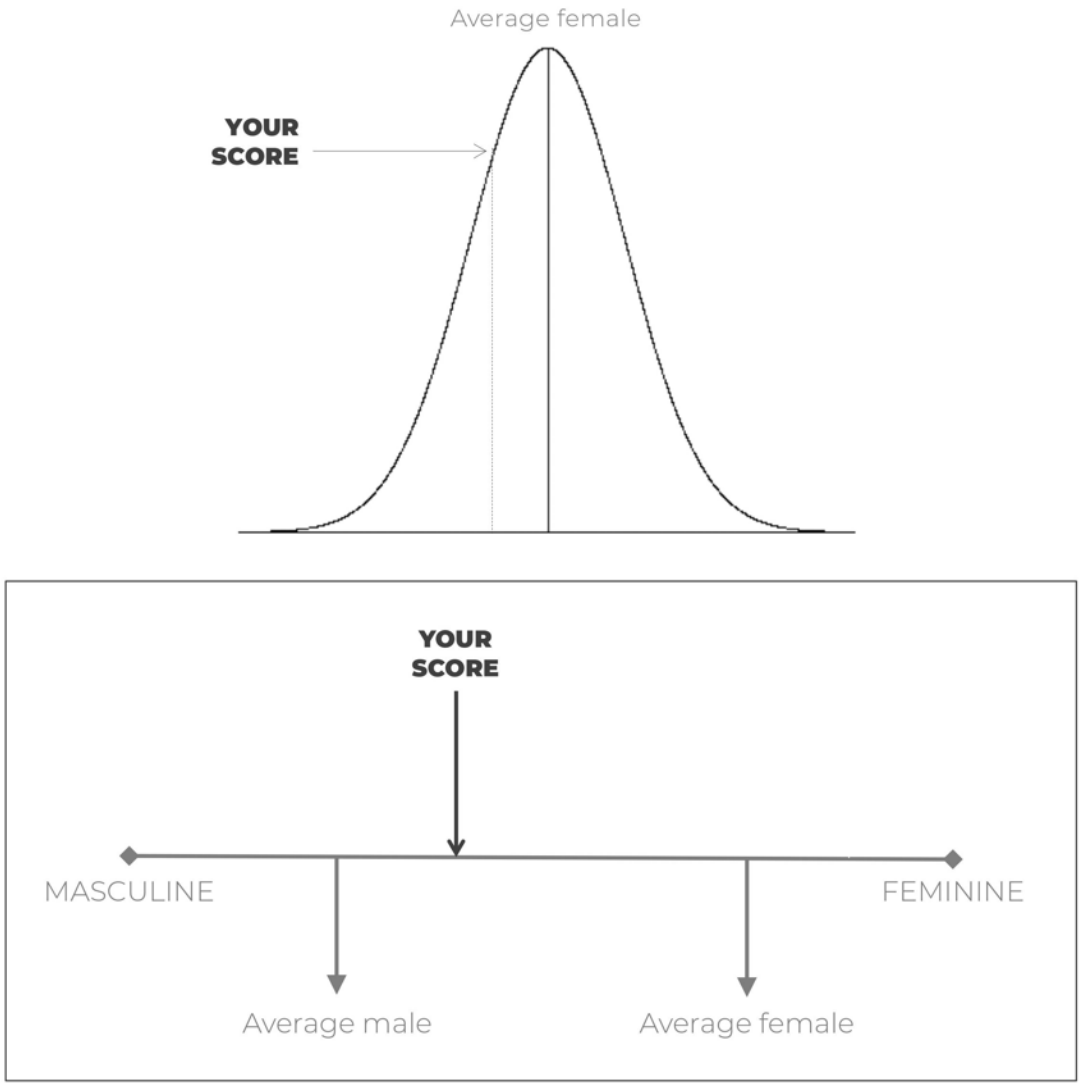

Figure 1.2. Example of threatening feedback

Because descriptive gender stereotypes represent beliefs about what women and men are like—and how they differ, situations indicating that a person is lower than the average gender ingroup member on a dimension that ingroup members are typically higher than outgroup members on can be understood as a threat to that person's gender stereotypicality. (And situations indicating that a person is higher than the average gender ingroup member on a dimension that ingroup members are typically higher than outgroup members on can be

understood as an affirmation of that person's gender stereotypicality.) Accordingly, throughout this dissertation, I refer to these situations as *gender stereotypicality threats*—or, more simply, as *femininity threats* for women and *masculinity threats* for men.[6]

Beyond Masculinity Threats

In addition to filling a gap in the literature on how gender stereotypes hurt women, this dissertation also challenges prevailing understandings of *whom* gender stereotypicality threats harm. Over the past fifteen years, research on *masculinity threat* has abounded. An APA PsycINFO search for "masculinity threat" in peer-reviewed journal articles published through 2020 produces 155 results, all but one of which (Babl, 1979) were published after 2006. A search for "femininity threat," on the other hand, produces a mere 2 results (Gordon & Glass, 1970; António et al., 2017). Similarly, Google Scholar searches, which include publications outside the field of psychology, produce 750 results for "masculinity threat" and only 21 for "femininity threat." Clearly, whereas men's responses to gender stereotypicality threats has become a topic of great interest, women's responses to such threats have been all but ignored.

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[6] The concept of *gender stereotypicality threat* is closely related but not identical to the concept of *gender role stress*. *Gender role stress* refers to the stress experienced in situations that are thought to be more stressful for one gender group than another (Eisler & Skidmore, 1987; Gillespie & Eisler, 1992)—or, in other words, to the stress associated with being a member of a particular gender group. Although *gender stereotypicality threats* can *trigger gender role stress* (e.g., being told that one is "sweet" might be more stressful for men than women), so too can other situations (such as expressing vulnerable emotions, which might be more stressful for men than for women, or thinking that one is being followed, which might be more stressful for women than for men; Eisler & Skidmore, 1987; Gillespie & Eisler, 1992). Additionally, although gender stereotypicality threats *can* produce stress, they do not *necessarily* produce stress. Finally, the term *gender role stress* tends to refer to one's experiences across a variety of situations, rather than one's response to a specific situation. Therefore, throughout the remainder of this dissertation I focus on *gender stereotypicality threats* and the psychological consequences thereof, rather than on *gender role stress* more broadly.

Fully explaining this asymmetry would require a deep dive into the history of the psychology of gender, which is outside the scope of this dissertation. Here, however, I provide a very brief overview of this history to situate this dissertation within the overall trajectory of research on gender stereotypicality threats.

Research and theorizing on the psychology of women emerged in the 1970s in response to concerns about androcentrism and other gender biases that had plagued the field of psychology since its inception (Deaux, 1985; Eagly et al., 2012). Marking the psychology of women as just that—*the psychology of women*, however, has the potential to reinforce the androcentric understanding of men as normative, neutral, and generic and women as marked, gendered, and *other* (Bailey et al., 2019; Parlee, 1975). In the following decades, researchers therefore increasingly recognized the importance of studying men *as men*—as gendered, rather than neutral, people (Cochran, 2010; Peretz, 2016).

The psychological study of men and masculinity was firmly established in the 90s, when the first issues of *Journal of Men's Studies*, *Masculinities* (which became *Men and Masculinities)*, and *Psychology of Men & Masculinity* (which became *Psychology of Men & Masculinities*) were published and when the American Psychological Association's Society for the Psychological Study of Men and Masculinity (Division 51) was founded (Cochran, 2010). This solidification of men *as men* as a discrete and important object of psychological inquiry largely coincided with a broader shift in the social sciences and humanities from "women's studies" to "gender studies" (or "women's and gender studies;" Richardson & Robinson, 1994).

Research on the psychology of men and masculinity has continued to grow since the 90s, and an APA PsycINFO search for "masculinity" as a key concept in peer-reviewed journals reveals that it is currently in its heyday. This search produces 63 results for all years

through 1960, 233 for 1961-1980, 557 for 1981-2000, and 4147 for 2001-2020 (compared to 55, 257, 507, and 1333, respectively, for "femininity"). Given this trend in the field, it is not surprising that research on gender stereotypicality threats has focused primarily on threats to men's masculinity, rather than threats to women's femininity. This asymmetry was also likely reinforced by the 2008 finding that men, but not women, experience anxiety in response to threats to their gender stereotypicality (Vandello et al., 2008). The heightened attention to the psychology of men and masculinity, however, may have come at a cost.

Shining a light on the experiences of dominant group members (in this case, men) *as dominant group members*—and thus eliminating the practice of considering dominant group members to be neutral—is a critical element of any effort to make psychology more equitable and comprehensive. Investigating the experiences of subordinated group members (in this case, women), however, also remains vital. In other words, fully understanding the psychology of gender requires research focused on the experiences of men, as well as research focused on the experiences of women. And fully understanding the psychology of gender stereotypicality threats requires research on masculinity threats, as well as research on femininity threats. The large majority of research on this phenomenon, however, has focused on the former. Chapter 2 of this dissertation begins to remedy the asymmetry in the literature on gender stereotypicality threats by focusing specifically on women's responses to femininity threats.

Chapter 2 also examines mechanisms by which gender stereotypicality threats might produce negative psychological consequences. Understanding these mechanisms is critical to truly understanding the effects of gender stereotypicality threats on both women and men. Specifically, in the final study of Chapter 2, I test whether women and men interpret threats to their gender stereotypicality as threats to their gender identity—that is, as identity

invalidation—and whether this sense of identity invalidation can help to explain the broader effects of these threats. In other words, I test whether gender stereotypicality threats indeed feel like gender identity threats when gender identity is understood as one's internal sense of femaleness/maleness, femininity, and masculinity.

Identity Invalidation

Identity invalidation refers to the rejection, denial, or lack of recognition of one's internal sense of self or one's membership in a social group of which one considers oneself a part (Campbell & Troyer, 2007; Cheryan & Monin, 2005; Franco & O'Brien, 2018). Although the term *identity denial* is more common in the literature, I use *invalidation* to encompass both identity denial (e.g., "You are not a woman;" Albuja, Sanchez et al., 2019) and more subtle forms of invalidation, such as identity *questioning* (e.g., "Are you sure you're a woman?"; Albuja, Sanchez et al., 2019). Identity invalidation can have negative psychological consequences (Cheryan & Monin, 2005), especially when the invalidated identity is central to one's overall sense of self (Bosson et al., 2012; McLemore, 2018; Prewitt-Freilino et al., 2012). For example, American Indian adults who outsiders perceive as belonging to another race (not American Indian) experience higher rates of depression and suicidality than those who are recognized as American Indian (Campbell & Troyer, 2007). Multiracial individuals who are forced to indicate a single racial identity on a demographic form show lower self-esteem than those who are allowed to select multiple racial identities (Townsend et al., 2009). Biracial (White and another race) individuals report stress after their White identity is denied (Albuja, Gaither, et al., 2019). And bicultural (Asian American) individuals whose American identity is denied experience heightened levels of stress, as indicated by both self-report and cortisol reactivity (Albuja, Gaither, et al., 2019).

Identity invalidation is a form of *social identity threat*, a relatively broad construct that refers to any situation that puts one's social identity (e.g., gender, race, religious group, etc.) in jeopardy (Reese et al., 2014) and that includes *categorization threats* (when one wants to be thought of as individual but is instead thought of in terms of one's group membership), *distinctiveness threats* (when one believes another group is "too" similar to one's ingroup), *threats to the value of social identity* (when one's ingroup is disparaged), and *acceptance threats* (when one is thought not to be a member of one's ingroup) (Branscombe et al., 1999). Notably, in some instances of *acceptance threat*, an individual's group membership is not denied outright; rather, that individual may simply be thought of as an atypical group member (Branscombe et al., 1999). Although *acceptance threat* was originally conceptualized as an intragroup phenomenon (perpetrated by ingroup members), both ingroup and outgroup members can threaten one's group membership. Additionally, although *identity invalidation* has previously been classified as a form of *categorization threat* (Townsend et al., 2009), it does not typically involve thinking of a person as a group member, rather than an individual. Rather, it involves *not* thinking of a person as a member—or a typical member—of a particular group. I therefore assert that *identity invalidation* falls into the category of *acceptance threat* (Scaptura & Boyle, 2020)—regardless of whether the perpetrator is an ingroup or outgroup member.

As mentioned earlier, although little work on femininity threats exists, research that *has* looked at such threats—and that has compared them to masculinity threats—suggests that gender stereotypicality threats are more consequential (i.e., psychologically distressing) for men than women. Although both women and men experience fear of backlash (repercussions for nonconformity to gender stereotypes) and reduced self-esteem in response to psychological gender stereotypicality threats, these effects are stronger and more consistent for men than women (Rudman et al., 2007; Rudman & Fairchild, 2004).

Additionally, men, but not women, experience anxiety in response to psychological gender stereotypicality threats (Vandello et al., 2008)—a disparity that has been attributed to a concept called *precarious manhood* (Vandello & Bosson, 2013). According to the theory of *precarious manhood*, manhood is a social status that must constantly be striven for, achieved, and maintained through actions, whereas womanhood is a physical status that once obtained, is permanent (Weaver et al., 2010).

However, women not being as negatively affected as men are by psychological gender stereotypicality threats does not necessarily mean that women are not as negatively affected as men are by *all* types of gender stereotypicality threats. Rather, as tested in Chapter 2, women and men might simply experience anxiety in response to gender stereotypicality threats in distinct domains. If when it comes to other people, but not oneself (as discussed earlier), femininity is defined largely in terms of physical appearance and masculinity largely in terms of behaviors and social roles, then one would expect women to experience threats to their physical femininity as threats to their identity and men to experience threats to their psychological masculinity as threats to their identity. In other words, if physical femininity is a core component of judgments of women's overall femininity, as the evidence suggests, then if a woman *identifies* as feminine but does not have a feminine physical appearance, there will likely be a discrepancy between how feminine she is evaluated as and how feminine she feels. Similarly, if psychological masculinity is a core component of judgments of men's overall masculinity, then if a man identifies as masculine but does not have a masculine personality, there will likely be a discrepancy between how masculine he is evaluated as and how masculine he feels. Given the research on consequences of identity invalidation (Albuja, Gaither, et al., 2019), these discrepancies will likely produce anxiety and reduced self-esteem. The final study in Chapter 2 of this dissertation investigates this prediction by examining

whether physical, but not psychological, gender stereotypicality threats produce a feeling of identity invalidation and therefore increased anxiety and reduced self-esteem in women whereas psychological, but not physical, gender stereotypicality threats produce a sense of identity invalidation and therefore increased anxiety and reduced self-esteem in men.

Summary

In this chapter, I have laid the groundwork for my dissertation research on women's responses to physical femininity threats by clarifying key terms and mapping out the landscape of existing research on gender stereotypes, gender identity, identity invalidation, and physical appearance. Further, I have suggested that research on gender stereotypicality threats should broaden its scope to include threats to women's *physical* gender stereotypicality and deepen its contribution by examining the mechanisms by which these threats may produce psychological distress.

The majority of literature on gender stereotypes has focused on personality traits, social roles, and occupations and has revealed that within these domains, masculinity is prescribed (and femininity proscribed) for men and boys to a greater extent than femininity is prescribed (and masculinity proscribed) for women and girls. Accordingly, when men—but not women—receive feedback that they are counter-stereotypical, they experience stress and anxiety.

In this chapter, I have suggested that consideration of an often-neglected domain of gender stereotypes—physical appearance—could lead to a re-evaluation of this discrepancy between women and men. Physical appearances, I have suggested, are more central to lay conceptions of women's femininity than men's masculinity. Furthermore, women are expected to appear and are valued for appearing physically feminine. Accordingly, women may become distressed when their *physical*—but not their psychological—femininity has

been threatened. I have also suggested that women and men alike may experience identity invalidation when their gender stereotypicality has been threatened and that this felt discrepancy between internal identity and external feedback may help to explain experiences of increased anxiety and reduced self-esteem in the wake of such threats.

Overview of Dissertation

In this dissertation, I present four experimental studies. The goal of these studies, presented in Chapter 2, was to: (a) examine women's psychological responses to physical femininity threats; (b) determine whether women and men experience psychological distress in response to threats to their gender stereotypicality within distinct—or overlapping—domains; and (c) determine whether felt identity invalidation can help to explain why threats to gender stereotypicality cause psychological distress in the form of increased anxiety and reduced self-esteem.

Across these four studies, I found that: (a) women experience increased anxiety and reduced self-esteem in response to threats to their physical femininity, as compared to affirmations of their physical femininity; (b) whereas men experience anxiety in response to masculinity threats, compared to affirmations, across the domains of physical appearance and personality, women only experience anxiety in response to femininity threats, compared to affirmations, within the domain of physical appearance; and (c) felt identity invalidation—in the form of a discrepancy between an external evaluation of one's gender stereotypicality and one's internal identity—mediates the observed relationships between gender stereotypicality feedback and both anxiety and self-esteem.

In Chapter 3 of this dissertation, I explore the theoretical and practical implications of this work and highlight key directions for future research. Overall, this dissertation highlights the importance of centering the experiences of women in psychological research.

Women may not experience distress in response to the exact same types of gender stereotypicality threats that men do; this does not mean, however, that they do not experience distress in response to *any* types of gender stereotypicality threats. Additionally, this work highlights the need for more research on the content and consequences of gender stereotypes within a frequently neglected domain: physical appearance. Finally, these studies indicate that psychological research on gender and physical appearance ought to move beyond its traditional focus on attractiveness and examine other facets of appearance, including gender stereotypicality, that may be highly consequential for both women's and men's psychological well-being.

Table 1.2
Key Terms

feminine (as used when discussing gender stereotypes)	descriptively or prescriptively stereotypical of women and/or girls
femininity (as used when discussing gender stereotypes)	Possession of an individual characteristic or set of characteristics that are descriptively or prescriptively stereotypical of women and/or girls
gender identity	"the quality and strength of the cognitive connections...that a person makes between the self and a gender category" (Tobin et al., 2010); as used here, a two-dimensional construct consisting of: (a) one's internal sense of one's femaleness and maleness; and (b) one's internal sense of one's femininity and masculinity.
gender prototype	a mental representation of a highly typical or representative instance of a gender category (Brewer et al., 1981; Helgeson, 1994; Smith & Zarate, 1990)
gender norms	prescriptive (and potentially descriptive) beliefs about women, men, girls, and boys; can be used to refer specifically to beliefs about behaviors
gender role stress	the stress experienced in situations that are thought to be more stressful for one gender group than another (Eisler & Skidmore, 1987; Gillespie & Eisler, 1992)—or, in other words, to the stress associated with being a member of a particular gender group

gender stereotypes	"consensual beliefs about the differing characteristics of men and women in our society" (Rosenkrantz et al., 1968, p. 287)
gender stereotypicality threats	situations that suggest that a person is counter-stereotypical—that is, non-adherent to descriptive and/or injunctive beliefs about their gender group and instead adherent to descriptive and/or injunctive beliefs about the *other* primary gender group; sometimes referred to as *gender identity threats* (Sinclair & Carlsson, 2013; Willer et al., 2013) or *gender role threats* (Bosson et al., 2009)
identity invalidation	the rejection, denial, or lack of recognition of one's internal sense of self or one's membership in a social group of which one considers oneself a part (Campbell & Troyer, 2007; Cheryan & Monin, 2005; Franco & O'Brien, 2018); also known as *identity denial*
masculine (as used when discussing gender stereotypes)	descriptively or prescriptively stereotypical of men and/or boys
masculinity (as used when discussing gender stereotypes)	Possession of an individual characteristic or set of characteristics that are descriptively or prescriptively stereotypical of men and/or boys
precarious manhood	manhood as a social status that must constantly be striven for, achieved, and maintained through actions (Vandello & Bosson, 2013; Weaver et al., 2010)
sex (or gender) role	the collection of stereotypes associated with one gender or the other (Eagly & Karau, 2002)
sex-typed	(a) possessing characteristics that are prescriptively stereotypical of one's gender group and *not* possessing characteristics that are prescriptively stereotypical of the *other* primary gender group (Bem, 1974; Spence & Helmreich, 1980); (b) aligned with a particular gender identity (Bailey & Zucker, 1995); or (c) normative or expected of or associated with one gender or the other (Wood et al., 1997)
social identity threat	a relatively broad construct that refers to any situation that puts one's social identity (e.g., gender, race, religious group, etc.) in jeopardy (Reese et al., 2014) and that includes *categorization threats* (when one wants to be thought of as individual but is instead thought of in terms

	of one's group membership), *distinctiveness threat* (when one believes another group is "too" similar to one's ingroup), *threats to the value of social identity* (when one's ingroup is disparaged), and *acceptance threats* (when one is not thought to be a member of one's ingroup, likely because they are a non-prototypical member) (Branscombe et al., 1999)
social norms	"rules and standards that are understood by members of a group, and that guide and/or constrain social behavior without the force of laws" (Cialdini & Trost, 1998, p. 152)
social roles	"set[s] of expectations oriented toward people who occupy a certain 'position' in a social system or group" (Gouldner, 1957, p. 282)
stereotype	a generalized belief about a group of people (Ashmore & Del Boca, 1979, 1981)

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Chapter 2: Women's Psychological Responses to Physical Femininity Threats: Increased Anxiety, Reduced Self-Esteem

This chapter is adapted from a manuscript in preparation by Wittlin, N. M., LaFrance, M., Dovidio, J. F., & Richeson, J. A.

Abstract

Across four experiments (N = 2494 after exclusions), the authors found that cisgender women experience higher levels of anxiety (Studies 1a, 1c, and 2) and lower levels of self-esteem (Studies 1c and 2) in response to feedback indicating that their physical appearance is less feminine than average (i.e., physical femininity threats) than feedback indicating that their physical appearance is more feminine than average (i.e., physical femininity affirmations). Feedback on the femininity of their personality had no effect on anxiety or self-esteem (Study 2). Physical femininity feedback had an effect on anxiety and self-esteem even when physical attractiveness was affirmed (in the case of anxiety; Study 1a) and even when controlling for self-perceived physical attractiveness (in the case of both anxiety and self-esteem; Studies 1a and 1c), indicating that the observed effects of physical femininity feedback on anxiety and self-esteem were not simply a result of this feedback being interpreted as physical attractiveness feedback. Cisgender men, unlike women, experienced increased anxiety—but not reduced self-esteem—in response to threats to their masculinity across the domains of physical appearance and personality, though this effect was stronger within the domain of physical appearance (Study 2). A discrepancy between the results one received and one's beliefs about oneself mediated the effects of feedback on both anxiety and self-esteem, in the case of women, and on anxiety, in the case of men (Study 2). Together, these results highlight the need to center physical appearance in research on gender stereotyping and its consequences.

Keywords: anxiety, femininity, invalidation, self-esteem, stereotypes

"Look like a lady; act like a man; work like a dog." This was the final message of a 1990 *Fortune* magazine piece on how gender discrimination has impeded women's ascent up the corporate ladder (Fierman, 1990). In recent decades, several books and articles have advised women to engage in traditionally masculine behaviors if they want to succeed (e.g., Sandberg, 2013; Teague Moreno, 2019), and indeed, women are increasingly participating in traditionally masculine activities (Haines et al., 2016), pursuing degrees in traditionally masculine fields (Haines et al., 2016), and self-identifying with stereotypically masculine traits (Donnelly & Twenge, 2017), which are generally highly valued and often considered sexually attractive (Cejka & Eagly, 1999; Feinman, 1981; Rudman & Glick, 1999; Schudson et al., 2018). Women are also *decreasingly* self-identifying with stereotypically feminine traits (Donnelly & Twenge, 2017). Furthermore, there is some evidence that associations between women and traditionally feminine personality traits weakened over the course of the 20th century (Bhatia & Bhatia, 2020; but see Eagly et al., 2020). Perhaps as a consequence of the high status of masculine personality traits and the increasing acceptance of these traits in women, whereas men, on average, have been shown to experience anxiety in response to threats to their psychological gender stereotypicality (i.e., information suggesting that psychologically they are gender counter-stereotypical[7]), women, on average, have not

[7] Throughout this manuscript, we use the term "counter-stereotypicality," rather than "non-stereotypicality," to refer to characteristics that sit in opposition to those that are expected of members of a social group. A person can be "non-stereotypical" by virtue of lacking characteristics that are expected of members of one's social group *or* possessing characteristics that sit in opposition to those that are expected of members of a social group. "Counter-stereotypicality" refers solely to the latter. Within the context of gender, which is generally viewed as highly bipolar (with femininity on one end and masculinity on the other; Biernat, 1991), "counter-stereotypicality" refers to femininity in men and masculinity in women. Precedent for drawing a distinction between "non-stereotypicality" and "counter-stereotypicality" can be found in early gender research that distinguished between individuals who were "cross-typed" (i.e., counter-stereotypical) and individuals who were "undifferentiated" (i.e., non-stereotypical but not counter-stereotypical; Bem, 1981).

(Vandello et al., 2008). Additionally, although both men and women experience reduced explicit self-esteem and increased fear of backlash after succeeding on a cross-sex-typed test, as compared to a sex-typed test, these effects have been stronger and more reliable for men than they have been for women (Rudman et al., 2007; Rudman & Fairchild, 2004). The objective of the current research was to examine women's psychological responses to threats to their gender stereotypicality within a novel domain—physical appearance—and, in doing so, to interrogate the prevailing understanding of gender stereotypicality threats as primarily affecting men, broaden the scope of inquiries into the consequences of gender stereotypes, and shed light on a possible underexamined contributor to negative psychological outcomes in women.

As the guidance in *Fortune* magazine suggests, even though behaving in a more counter-stereotypical, masculine manner has become increasingly (albeit not yet completely) normative for women, the same has not been true for physical counter-stereotypicality. Historically, physical appearance has had a major influence on how women are judged (Burton et al., 1995), and this standard remains prominent today (Fairygodboss; Girlguiding, 2013; Univia, 2019). The physical appearances of women in fields ranging from sports to politics remain highly scrutinized, and women who have a more masculine physical appearance are not only perceived as unattractive but are also criticized, mocked, and censured because they are deemed inadequately physically feminine by virtue of their muscularity, facial or body hair, or clothing (Chalabi, 2017; Clemente, 2016; Jespersen v. Harrah's Operating Co., 2006; Kendall, 2015). Physical appearance constitutes an important domain of gender stereotypes (i.e., of beliefs about what women and men are like and should be like; Deaux & Lewis, 1984; Cejka & Eagly, 1999), and indeed, "males and females are

viewed as more different on physical dimensions than they are on psychological dimensions" (Deaux & Lewis, 1984, p. 1003).

Nonetheless, studies on responses to gender stereotypicality threats have primarily threatened *psychological* gender stereotypicality. They have provided participants with false feedback about their "gender identity" (defined to participants as their "psychological masculinity or femininity;" J. Vandello, personal communication, January 24, 2017), "self-concept" (Dahl et al., 2015), or simply their masculinity or femininity based on a "gender knowledge test" (e.g., Dahl et al., 2015; Rudman et al., 2007; Vandello et al., 2008), "gender identity survey" (the Bem Sex Role Inventory; Bem, 1974; Willer et al., 2013), personality test (e.g., Hunt et al., 2016; Konopka et al., 2019; Parent et al., 2018), and/or inventory of interests (Frederick et al., 2017) or consumer preferences (Cheryan et al., 2015). In these studies, all participants typically receive feedback indicating they are somewhat atypical—that is, different from the average person in their gender group—but whereas those in the threat condition receive feedback indicating that they are *counter-stereotypically* atypical, those in the affirmation condition receive feedback indicating that they are *stereotypically* atypical. In a few other studies, participants have received false feedback about their physical gender stereotypicality—for example, their strength and testosterone levels (Cheryan et al., 2015; Kosakowska-Berezecka et al., 2016). To our knowledge, however, no studies to date have provided participants with false feedback on the gender stereotypicality of their *physical appearances*. Furthermore, the majority of these studies have focused exclusively on men's responses to masculinity threats (for some exceptions, see Rudman et al., 2007; Rudman & Fairchild, 2004; Vandello et al., 2008) and not on women's responses to femininity threats.

There are several reasons to believe that women would find threats to the femininity of their physical appearances particularly anxiety-provoking. First, evidence suggests that

physical appearance constitutes the domain of femininity that is most salient when people consider whether a woman is feminine overall (Spence & Sawin, 1985; Aube et al., 1995; but see Helgeson, 1994). Indeed, some theorists have asserted that physical appearance is not merely an important component of the female gender role but indeed its very essence—with society positioning women as objects to be seen and defining them by their "to-be-looked-at-ness" (Mulvey, 1999, p. 837; Fredrickson et al., 1998). Correspondingly, fears related to physical appearance have been conceptualized as a key element of feminine gender role stress (Gillespie & Eisler, 1992). Additionally, when women are asked to complete the open-ended sentence, "As a woman," they mention physical appearances more than any other aspect of their experiences (other than gender-based discrimination, which is mentioned at comparable rates; Shea et al., 2014). And when people hear someone say that another person is or is not a "real woman," they tend to believe the speaker is referring to something about that person's physical appearance (J. Bosson, personal communication, February 9, 2021). Furthermore, in visual sex categorization tasks, only highly feminized faces and bodies are consistently categorized as female (e.g., Armann & Bülthoff, 2012; Davidenko, 2007; Johnson et al., 2012), suggesting that women, more so than men, must be highly gender stereotypical be categorized accurately. Finally, masculine-looking women, compared to feminine-looking women, masculine-looking men, and feminine-looking men, are described in overwhelmingly negative terms (Sutherland et al., 2015), suggesting that women must look sufficiently feminine to be judged positively.

The pervasiveness of grooming among women—and the specific types of grooming that women tend to engage in—provides evidence that women are, indeed, invested in appearing physically feminine and therefore that threats to their physical femininity would likely induce anxiety. Women's grooming constitutes not only "beauty work" (Kwan &

Trautner, 2009)—that is, labor intended to enhance physical attractiveness—but also femininity work (Chrisler, 2013)— that is, labor intended to enhance physical femininity. Facial characteristics that are more common in women than men—including high contrast between features and skin, smooth skin, and a lack of facial hair (Rhodes, 2006; Russell, 2009)—are also generally considered attractive in women (Penton-Voak et al., 2004; Rhodes et al., 2000). Thus, when women remove facial hair and apply lipstick and eye makeup, they enhance their physical femininity. And indeed, the majority of women regularly use cosmetics, skin care products, and hair styling products, and up to 96% engage in some form of body hair removal (Harris Poll , 2014; Tiggemann & Hodgson, 2008; Toerien et al., 2005). Given that physical appearances constitute a key facet of femininity and womanhood, that having a highly feminine physical appearance is required for categorization as female, and that women invest heavily in cosmetic application and hair removal, even though threats to psychological femininity have not been shown to provoke anxiety in women, threats to physical femininity might.

The goal of the current research was to determine whether women experience greater anxiety in response to threats to the femininity of their physical appearances than affirmations of the femininity of their physical appearances, as well as whether physical femininity threats are particularly anxiety-inducing for women who consider their gender to be a core part of their overall sense of self and women who do not believe they have control over how feminine they look. We were also interested in whether women experience lower self-esteem in response to threats to the femininity of their physical appearances than affirmations of the femininity of their physical appearances. State anxiety and state self-esteem are moderately to highly negatively correlated (Besser et al., 2008; Heatherton & Polivy, 1991), and the same situations can threaten both (Spielberger, 1972, p. 490). They are

conceptually distinct, however, with the former representing an emotional response to a stimulus and the latter representing an attitude toward the self (Beck et al., 2005, p. 9; Rosenberg, 1962). A secondary goal of the current research was to determine whether physical femininity threats are distinguishable from physical attractiveness threats—that is, whether women find physical femininity threats anxiety-provoking even when their physical attractiveness has been affirmed. A tertiary goal was to determine whether the sense that one's identity (as a woman, as female, as feminine, and/or overall) or sense of self is being denied (Cheryan & Monin, 2005) could help to explain the predicted effect of physical femininity threats on anxiety and potentially self-esteem among women. In other words, we were interested in identity invalidation as a potential mechanism underlying the predicted relationships between gender stereotypicality feedback and both anxiety and self-esteem. A final goal was to examine whether men, too, experience anxiety in response to threats to the masculinity of their appearances. By examining women's responses to physical femininity threats (and, in the final study, men's responses to physical masculinity threats), we aimed to shed light on potentially harmful consequences of gender stereotypes within the domain of physical appearance.

The Current Research

Because past work has demonstrated that unlike men, women do not experience anxiety in response to threats to their psychological gender stereotypicality (Vandello et al., 2008) and because the general consensus within the field of psychology seems to be that masculinity is prescribed for men to a greater extent than femininity is prescribed for women (Sirin et al., 2004), the majority of research on gender stereotypicality threats has focused on *masculinity* threats and on consequences of the pressure on men to eschew femininity and embody ideals of traditional masculinity (e.g., Caswell et al., 2014; Himmelstein et al., 2018;

Kramer et al., 2017). As a result, this body of research may have missed out on important ways in which prescriptive gender stereotypes constrain and harm women. We cannot assume that women do not experience anxiety in response to *any* sorts of gender stereotypicality threats simply because they do not experience anxiety in response to the sorts of threats that have produced anxiety in men. Such an assumption can lead us to overlook unique elements of women's experiences and to fail to consider the full range of risks that prescriptive gender stereotypes may present. Determining whether women are indeed vulnerable to psychological harm stemming from physical gender stereotypicality threats can help to provide a more comprehensive understanding of both the content and consequences of gender stereotypes.

The aim of the current set of studies was therefore to examine women's psychological responses to feedback indicating that they are—or are not—feminine in physical appearance. We predicted that women who were told their physical appearance was less feminine than the average female in their age group would experience more anxiety than women who were told their physical appearance was more feminine than the average female in their age group (i.e., also atypical, but in a stereotype-congruent way) (Studies 1a-c & 2), regardless of whether or not they were told that their physical appearance was more attractive than the average female in their age group (Studies 1a & 1b) and even when accounting for self-perceived physical attractiveness (Studies 1a-c). We also predicted that, consistent with past literature, women who were told their *personality* was less feminine than the average female in their age group would *not* experience more anxiety than women who were told their personality was more feminine than the average female in their age group but that men who were told their personality was less masculine than the average male in their age group *would* experience more anxiety than men who were told their personality was more

masculine than the average male in their age group (Study 2). Finally, we anticipated that a feeling of identity invalidation would help to explain the predicted effects of feedback about one's gender stereotypicality (i.e., femininity for women and masculinity for men) on anxiety (Study 2). We also explored the effects of gender stereotypicality feedback on self-esteem and several other relevant variables. We only pre-registered formal hypotheses for anxiety, however, as our principal goal was to determine whether receiving information suggesting that one is physically gender counter-stereotypical would produce anxiety in women, just as receiving information suggesting that one is psychologically gender counter-stereotypical has been shown to produce anxiety in men (Vandello et al., 2008).

Studies 1a, 1b, and 1c

The primary purpose of Studies 1a-c was to determine whether cisgender women (i.e., women who were assigned to the female sex at birth) experience more anxiety in response to feedback indicating that they are less physically feminine than average compared with feedback indicating that they are more physically feminine than average. Study 1a tested this question. Study 1b sought to assess the robustness of the effect observed in Study 1a with a slightly different experimental set-up. Study 1c sought to reconcile the inconsistent results of Studies 1a and 1b.

In all three studies, participants were told that their physical appearance would be assessed by novel image analysis software. After uploading photographs of themselves, they received feedback on their physical femininity. The feedback on their physical femininity was threatening (i.e., indicated that they were less feminine than average), affirming (i.e., indicated that they were more feminine than average), or, in Studies 1a and 1b, absent. Studies on masculinity and femininity threat typically include only a threat and an affirmation condition. However, in Studies 1a and 1b, we included a feedback absent condition, which served as a

control group, to examine whether the predicted effect of physical femininity feedback on anxiety was driven by participants whose femininity was threatened or those whose femininity was affirmed.

Participants then reported their current levels of anxiety. We predicted that women who were told that their physical appearance was less feminine than average (i.e., those whose physical femininity was threatened) would experience higher levels of state anxiety than those who were told their physical appearance was more feminine than average (i.e., those whose physical femininity was affirmed).

A secondary goal of these studies was to determine whether the predicted effect of physical femininity feedback on state anxiety was the result of women interpreting threats to their physical femininity as threats to their physical attractiveness. For women, physical femininity is considered a key component of—and thus highly predictive of—physical attractiveness (Penton-Voak et al., 2004; Rhodes et al., 2000), and physical attractiveness constitutes a gender-intensified prescriptive stereotype for women—that is, a characteristic that is valued in members of both major gender groups but in members of one gender group in particular (Parker et al., 2017; Prentice & Carranza, 2002). Furthermore, the large majority of women in the U.S., but only a minority of men, say they face intense pressure to appear physically attractive (Parker et al., 2017). Thus, it is theoretically possible that women would experience anxiety in response to feedback indicating that they are less physically feminine than average because they would interpret this feedback as indicating that they are less physically *attractive* than average and would find the latter anxiety-provoking. However, given that in addition to attractiveness, gender conformity *per se* is heavily prescribed (e.g., Rudman, 1998) and gender nonconformity censured (Rudman et al., 2012), we did not expect that to be the case. Rather, we expected physical femininity threats to be anxiety-

provoking for women independent of any threats to attractiveness that they might be thought to represent.

We addressed the possibility that physical femininity threats would be anxiety-provoking to women because they would be interpreted as physical attractiveness threats in three ways. First, in Studies 1a and 1b, we manipulated physical attractiveness feedback, such that participants were randomly assigned to receive affirming feedback or no feedback on their physical attractiveness. We expected physical femininity threats in and of themselves to be anxiety-inducing and therefore hypothesized that women would experience anxiety in response to threats to their physical femininity even when their physical attractiveness was affirmed. However, if physical femininity threats are anxiety-inducing because they represent physical attractiveness threats, we would expect to see an interaction between physical femininity feedback and physical attractiveness feedback, such that women would only experience anxiety in response to physical femininity threats when their physical attractiveness was not affirmed. Second, in all three studies, we examined whether physical femininity feedback had an effect on self-perceived physical attractiveness. Third, in all three studies we controlled for participants' self-perceived physical attractiveness.

We also sought to explore the possibility that cisgender women would experience not only anxiety but also reduced self-esteem in response to threats to their physical femininity, as compared to affirmations of their physical femininity. In past research, men have experienced lower levels of explicit self-esteem after succeeding in a gender counter-stereotypical, as compared to a gender stereotypical, domain (Rudman et al., 2007). Additionally, threats to physical femininity could be interpreted as threats to *identity* —that is, not solely as information that one is not feminine in a very particular way (in terms of their looks) but that they are not feminine or even female on the inside, at their core. And past

work has suggested that identity invalidation (i.e., rejection of one's membership in a group of which one considers oneself a part; Cheryan & Monin, 2005) may produce reductions in self-esteem (Garr-Schultz & Gardner, 2019; Townsend et al., 2009). Thus, we examined whether women who were told that their physical appearance was less feminine than average would experience lower levels of state self-esteem than women who were told their physical appearance was more feminine than average. We considered this aim exploratory, as we had a stronger theoretical rationale for predicting that physical femininity threats would produce anxiety than that they would reduce self-esteem but were interested in exploring both potential outcomes.

Finally, we were interested in potential moderators of the predicted effect of physical femininity feedback on state anxiety, as well as additional psychological outcomes, beyond anxiety and self-esteem, that threats to physical femininity might produce. In Study 1a, we considered the possibility that threats to physical femininity would be more anxiety-provoking for women who consider their gender to be a key facet of their overall sense of self than those who do not and less anxiety-provoking for women who believe their femininity is controllable than those who do not. In other words, we examined whether gender identity centrality (Rogers et al., 2015) and perceived controllability of femininity moderated the predicted effect of physical femininity feedback on state anxiety. In Study 1c, we considered the possibility that to cope with threats to their femininity, women who received feedback indicating that they were less physically feminine than average would: (a) make more external, situational attributions for their results than women who received feedback indicating that they were more physically feminine than average (Blaine & Crocker, 1993; Campbell & Sedikides, 1999; Kinderman & Bentall, 2000); (b) downplay the importance of their results (Frey & Stahlberg, 1986; Kashima & Triandis, 1986); and (c)

downplay the centrality of femininity to their overall sense of self (Aronson et al., 1995; Frey & Stahlberg, 1986).

Study 1a

The purpose of Study 1a was to establish the basic predicted phenomenon that cisgender women would experience higher levels of state anxiety in response to threats to their physical femininity than affirmations of their physical femininity.

Method

Participants and Design. Participants were randomly assigned to one of six conditions in a 3 (physical femininity feedback: affirmation, control, threat) x 2 (physical attractiveness feedback: affirmation, control) design. Participants were recruited through Amazon Mechanical Turk (MTurk) and paid $1.00 for their participation.

Because we had no specific predictions about effect size, we powered this study to detect an effect of $f = 0.2$, which is the average effect size for social psychology studies (Richard et al., 2003). An *a priori* power analysis (G*Power 3.1; Faul et al., 2007) indicated that to detect an interaction between physical femininity feedback and physical attractiveness feedback with 80% power and α of .05, a sample of 244 participants would be needed. Based on previous studies with MTurk samples, we estimated that 15% of participants would fail the attention checks and thus recruited 287 participants. An additional nine participants ended up completing the study for a total sample size of 296.

Eighty participants were excluded because they did not identify as a cisgender female (n=12)[8], did not upload a valid photograph (i.e., did not upload a photograph or uploaded a

[8] In all studies, participants were asked to report the sex they were assigned at birth, on their original birth certificate, and their gender identity. We chose to exclude transgender individuals from these studies primarily for ethical reasons. As with all studies that involve

photograph without any woman or with more than one woman in it; n=7), failed one or more attention checks (which required them to accurately recall whether their results indicated that their physical appearance was [a] more or less feminine than the average female in their age group—or whether they did not receive feedback on the femininity of their physical appearance and [b] more or less attractive than the average female in their age group—or whether they did not receive feedback on their attractiveness; n=61), and/or indicated that they intended some of their responses as jokes (n=4). Thus, we were left with a sample size of 216 (M_{age} = 37.13, *SD* = 11.96; 86.11% heterosexual; 81.02% White; 6.94% Black; 2.31% Hispanic or Latina; 1.39% East Asian; 0.46% Native Hawaiian or Pacific Islander; 7.88% other or multiracial/ethnic). Because the final sample size was smaller than intended, we conducted a sensitivity power analysis (G*Power 3.1; Faul et al., 2007), which

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deception and potentially upsetting feedback, we conducted a cost-benefit analysis to determine whether the knowledge gained from these studies would outweigh any potential harms to participants. In the case of transgender individuals, for whom experiences with identity denial (in the form of misgendering) are relatively common and often detrimental to psychological wellbeing (McLemore, 2018), we determined that it would not. Furthermore, transgender women's desire to possess a feminine physical appearance, though not universal (Nieder et al. 2019; Spade, 2003), has already been documented (Anderson et al., 2020; Sevelius, 2013). Many transgender women undergo medical procedures, including some that are costly and/or risky, to increase the femininity of their appearance, including their body shape, facial structure, and amount of facial and body hair (Grant et al., 2011; Kelly et al., 2020; Plemons, 2017; White Hughto et al., 2015). And transgender women report that these procedures increase the alignment between their external appearance and internal sense of self (Dubov & Fraenkel, 2018; Owen-Smith et al., 2018). Thus, we did not believe including transgender women in this sample could be justified. Further, at a practical level, the sorts of femininity threats that transgender women tend to experience are often different not only in degree but also in kind from the sorts of femininity threats that cisgender women tend to experience. Threats to cisgender women's femininity generally take the form of stereotypicality or prototypicality threats; they indicate that a woman is not "woman-like" in the way most women are or in the way women ought to be. Threats to transgender women's femininity, on the other hand, often suggest that a woman is not only insufficiently "woman-like" but also that in a very literal sense, she is not a woman. Thus, our interest in stereotypicality threats, rather than true denial of category membership, also informed our decision to focus on cisgender individuals in the current studies. All transgender individuals who enrolled in these studies were paid for their time.

indicated that we were powered to detect an effect of $f = 0.21$ (with 80% power and $\alpha = .05$).

Procedure. After reading the consent form, answering a series of question to confirm that they had carefully read the form, and agreeing to participate, participants were instructed to upload a photograph of themselves. They were told that the photograph would be analyzed by software that they would be given more information about later on. Specifically, they were instructed to upload a color photograph of their face in which they were directly facing the camera and had a neutral facial expression and both eyes open. They were then instructed to center the photograph. After uploading the photograph, participants were told that their photograph was being analyzed.

Participants were then presented with information about a fictitious "data consulting and software development firm" that was partnering with researchers in the departments of psychology and computer science to beta-test a new image analysis software. They were told that the software uses a neural network to assess the masculinity/femininity and attractiveness of one's facial appearance, compared to the appearances of others in one's gender and age group. To maximize consistency in participants' understandings of femininity and masculinity, we provided them with lists of the facial features that allegedly play the greatest role in determining the perceived masculinity/femininity of one's appearance. These features (masculine: coarse skin texture, pronounced jawline, pronounced cheekbones, pronounced brow ridges, thin lips, small eyes, facial hair; feminine: smooth skin texture, does not have pronounced jawline, does not have pronounced cheekbones, does not have pronounced brow ridges, thick lips, large eyes, does not have facial hair) were taken from research on sex differences in facial appearances (Johnson et al., 2012; Rhodes, 2006).

Participants were also provided with lists of the facial features that allegedly play the greatest role in determining the perceived attractiveness of one's appearance. These features (facial symmetry, feature positioning and alignment, proportionality, ease of processing [fluency]) were taken from research on physical attractiveness (Abu Arqoub & Al-Khateeb, 2011; Bashour, 2006; Fink et al., 2006; Johnston et al., 2005; Little et al., 2011; Trujillo et al., 2014). Because we aimed to tease apart the effects of physical femininity feedback and physical attractiveness feedback, we omitted physically feminine traits from the list of physically attractive traits and instead focused on traits that are not overtly gendered.

Participants were then presented with the supposed results of the software's analysis of their photograph. At this point, they were randomly assigned to the physical femininity affirmation condition (in which they were told their appearance was "more feminine than 73% of females in [their] age group"[9]), the physical femininity threat condition (in which they were told their appearance was "less feminine than 73% of females in [their] age group"), or the physical femininity control condition (in which they were told that an error had occurred and their physical femininity could not be analyzed). Results were provided in both written and graphic form, with participants' level of femininity placed on a spectrum that ranged from "masculine appearance" to "feminine appearance." For participants in the affirmation condition, the results indicated that their level of femininity was more feminine than the "average female." For participants in the threat condition, the results indicated that their level of femininity was lower than the "average female" but higher than the "average

[9] We used the terms "female" (and "male," in Study 2) rather than "woman" (and "man") in our study materials to be inclusive of both participants who identified as "women" (and "men") and those who identified as "girls" (and "boys" or "guys") (Chrisler, 2013).

male" (and closer to the "average male" than the "average female"). These results were modified from those used by Vandello et al. (2008).

Participants were also randomly assigned to the physical attractiveness affirmation condition (in which they were told their appearance was "more attractive than 85% of females in [their] age group") or the physical attractiveness control condition (in which they were told that an error had occurred and their physical attractiveness could not be analyzed). Again, results were provided in both written and graphic form, with participants' level of attractiveness placed on a spectrum that ranged from "unattractive appearance" to "attractive appearance."

After reviewing their results, participants were instructed to complete measures of state anxiety, state self-esteem, self-perceived attractiveness, gender identity centrality, and perceived controllability of femininity, as well as a manipulation check, all of which are described in the Measures section in the order in which they were administered. Participants also reported demographic information, completed an attention check, and indicated whether they had intended any of their responses as jokes. Participants were also asked whether they thought the results they had received were accurate and legitimate. We initially included questions about accuracy and legitimacy so that we could exclude participants who were suspicious of their results. However, we later realized that these were leading questions and thus not a valid measure of suspicion. Thus, we did not use responses to these questions as a basis for exclusion. We used more nuanced measures of suspicion in the following studies. (Of the four studies presented in this manuscript, Study 1a was the only one that was not preregistered.)

After responding to these questions, participants read a debriefing form and answered a series of question to confirm that they had carefully read and understood the

form. Finally, they completed a self-affirmation induction exercise (Cohen et al., 2006) designed to help them psychologically recover from potential threats to their positive sense of self.

Measures. For all studies, measures are described in the order in which they were presented to participants. The primary dependent variable of interest was state anxiety. We intended to measure global state-self-esteem as an exploratory dependent variable, but due to a programming error, we were unable to do so. (We measured state self-esteem in Studies 1b,1c, and 2). Measures of gender identity centrality and perceived controllability of femininity were included as exploratory moderators. A measure of self-perceived physical femininity was included as a manipulation check, and a measure of self-perceived physical attractiveness was included as both a manipulation check and a covariate. For correlations among all measured variables, see Table 2.1.

Table 2.1
Study 1a Correlation Matrix

Variables	1	2	3	4	5	6	7
1. State anxiety	--						
2. Self-perceived physical attractiveness	-.36***	--					
3. Self-perceived physical femininity	-.31***	.33***	--				
4. Gender identity centrality	.01	.20**	.24***	--			
5. Perceived controllability of femininity	-.25***	.19**	.07	.06	--		
6. Self-perceived sexual attractiveness[SM]	-.39***	.85***	.30***	.23***	.21**	--	
7. Self-perceived attractiveness of personality[SM]	-.35***	.49***	.23***	.14*	.17*	.47***	--

Note. *$p < .05$; **$p < .01$; ***$p < .001$; SM=Measure and results included as Supplemental Materials

State anxiety. Participants completed the 6-item short form version of the State-Trait Anxiety Inventory (Marteau & Bekker, 1992), in which they were asked to indicate, on a 4-point scale (1=Not at all, 2=Somewhat, 3=Moderately, 4=Very much), the extent to which each of the following statements represented how they felt at the moment: "I feel calm" (R); " I am tense;" "I feel upset;" "I am relaxed" (R); "I feel content" (R); "I am worried." This scale demonstrated high internal reliability (α = .87).

Self-perceived physical attractiveness. We measured self-perceived physical attractiveness for three reasons: (a) to assess the effectiveness of the physical attractiveness manipulation (i.e., as a manipulation check); (b) to determine whether the physical femininity manipulation had an effect on self-perceived physical attractiveness; and (c) to use as a covariate in our primary analyses. Self-perceived physical attractiveness was measured using a single-item, 7-point measure. Participants rated their physical attractiveness on a scale ranging from "I am not very physically attractive" to "I am very physically attractive" (Wade, 2000)[10]. We also measured self-perceived sexual attractiveness and attractiveness of personality for exploratory purposes (see Supplemental Materials).

Self-perceived physical femininity. We assessed the effectiveness of the physical femininity manipulation by asking participants to rate the femininity of their physical appearance, compared to the average female in their age group, on a 7-point scale ranging from "Much less feminine" to "Much more feminine."

[10] Participants also completed the Self-Perceived Sexual Attractiveness scale (SPSA; Amos & McCabe, 2015). However, this measure was included solely for use in an undergraduate senior thesis and therefore was not analyzed for the current manuscript.

Gender identity centrality.[11] We measured gender identity centrality using a modified version of the identity subscale of the Collective Self-Esteem Scale (Luhtanen & Crocker, 1992). Participants rated their agreement with the following statements on a 7-point scale ranging from 1 (Strongly disagree) to 7 (Strongly agree): "Being a female is an important part of my self image;" "Being a female is unimportant to my sense of what kind of person I am (R);" "Being a female is an important reflection of who I am;" "Being a female has very little to do with how I feel about myself (R);" "Being feminine is an important part of my self image;" "Being feminine is unimportant to my sense of what kind of person I am (R);" "Being feminine is an important reflection of who I am;" "Being feminine has very little to do with how I feel about myself (R)." We originally intended to analyze items related to "female" and "feminine" identity separately, with the former items tapping into strength of gender *identification* or the "importance of belonging to the category" female (Becker & Wagner, 2009). However, a factor analysis using principal components analysis with varimax rotation revealed that all of the items loaded onto a single factor (see Supplemental Materials for factor loadings and correlation matrix). Thus, all eight items were averaged to form a composite gender identity centrality score with high internal reliability ($\alpha = .93$).

Perceived controllability of femininity. We were interested in the possibility that perceived controllability of femininity would moderate the effect of physical femininity feedback on state anxiety—specifically, that threats to physical femininity would be less anxiety-provoking for women who consider their femininity to be largely under their control than those who do not. We measured perceived controllability of femininity using items adapted

[11] The order in which participants completed the measures of gender identity centrality and perceived controllability of femininity was randomly assigned, such that half of the participants completed the gender identity centrality measure first and the other half completed the perceived controllability of femininity measure first.

from the Weight Locus of Control Scale (Saltzer, 1982). Participants rated their agreement with the following items on a scale of 1 (Strongly disagree) to 6 (Strongly agree): "How feminine I look is entirely up to me;" "Having a feminine appearance is largely a matter of chance (R);" "No matter what I do, the femininity of my appearance will remain largely unchanged (R);" "I can control the femininity of my appearance in the way I desire;" "How feminine I act is entirely up to me;" "Having a feminine personality is largely a matter of chance (R);" "No matter what I do, the femininity of my personality will remain largely unchanged (R);" "I can control the femininity of my personality in the way I desire." Although we originally intended to analyze items related to appearance and personality separately, a factor analysis using principal components analysis with varimax rotation revealed three distinct factors with unexpected loading patterns. The four non-reverse-coded items loaded onto a distinct dimension, and each pair of reverse-coded items loaded onto a distinct dimension (e.g., "Having a feminine appearance is largely a matter of chance" and "Having a feminine personality is largely a matter of chance" loaded onto the same dimension). Neither all of the appearance-related items considered together ($\alpha = .57$) nor all of the personality-related items considered together ($\alpha = .42$) constituted a reliable scale. When all of the items were considered together, the scale was slightly more internally reliable ($\alpha = .63$). We proceeded with our planned analyses, with all appearance-related and personality-related items averaged to form a single perceived controllability of femininity score. These analyses should be interpreted with caution, however, given that the items used did not constitute a highly reliable scale.

Results

Manipulation Checks. To determine whether we had successfully manipulated self-perceived physical femininity and to examine whether physical attractiveness feedback had

any effect on self-perceived physical femininity, we conducted a 3 x 2 between-subjects analysis of variance (ANOVA) with physical femininity feedback and physical attractiveness feedback as the independent variables and self-perceived physical femininity as the dependent variable. As intended, there was a main effect of physical femininity feedback on self-perceived physical femininity, $F(2, 210) = 68.22$, $p < .001$, $f = 0.80$, such that participants in the threat condition perceived themselves as less physically feminine ($M = 3.31$, $SD = 1.20$) than participants in the control condition ($M = 4.52$, $SD = 1.04$) and participants in the control condition perceived themselves as less physically feminine than participants in the affirmation condition ($M = 5.34$, $SD = 1.10$; all Tukey's honestly significant difference [HSD] test ps $< .001$). There was no effect of physical attractiveness feedback on self-perceived physical femininity, $F(1, 210) = 0.36$, $p = .550$, $f = .03$, nor an interactive effect of physical femininity feedback and physical attractiveness feedback on self-perceived physical femininity, $F(2, 210) = 1.06$, $p = .349$, $f = 0.08$.

Next, to determine whether we had successfully manipulated self-perceived physical attractiveness and to examine whether physical femininity feedback had any effect on self-perceived physical attractiveness, we conducted another 3 x 2 between-subjects ANOVA with physical femininity feedback and physical attractiveness feedback as the independent variables and self-perceived physical attractiveness as the dependent variable. Unexpectedly, there was no effect of physical attractiveness feedback on self-perceived physical attractiveness, $F(1, 210) = 3.65$, $p = .057$, $f = .13$, though the results were trending in the intended direction, with participants in the affirmation condition perceiving themselves as more physically attractive ($M = 4.54$, $SD = 1.45$) than participants in the control condition ($M = 4.19$, $SD = 1.51$).

Also somewhat surprisingly, given that femininity constitutes a key component of attractiveness in women (Penton-Voak et al., 2004; Rhodes et al., 2000), there was no effect of physical femininity feedback on self-perceived physical attractiveness, $F(2, 210) = 0.85$, $p = .431$, $f = .09$, nor an interactive effect of physical femininity feedback and physical attractiveness feedback on self-perceived physical attractiveness, $F(2, 210) = 0.56$, $p = .575$, $f = .07$.

Self-perceived physical femininity and self-perceived physical attractiveness were moderately correlated, $r(214) = 0.33$, $p < .001$.

Primary Analyses. To determine whether, as predicted, physical femininity feedback had an effect on state anxiety regardless of physical attractiveness feedback, we ran an ANOVA with physical femininity feedback and physical attractiveness feedback as the independent variables and state anxiety as the dependent variable. As predicted, there was a medium-size main effect of physical femininity feedback, $F(2, 210) = 4.68$, $p = .010$, $f = .21$, such that participants in the threat condition ($M = 1.91$, $SD = 0.67$) reported higher levels of state anxiety than participants in the affirmation condition ($M = 1.60$, $SD = 0.61$; Tukey's HSD $p = .006$) (see Table 2.2 for means from all studies). There was no difference in levels of state anxiety between participants in the threat condition and those in the control condition ($M = 1.71$, $SD = 0.59$; Tukey's HSD $p = .181$) nor between participants in the control condition and those in the affirmation condition (Tukey's HSD $p = .595$).

Table 2.2
Effects of Feedback about Physical Appearance on State Anxiety

	Threat	Affirmation	Control
	M (SD)	M (SD)	M (SD)
Study 1a			
Female participants	1.91 (0.67)[a]	1.60 (0.61)[b]	1.71 (0.59)[ab]
Study 1b			
Female participants	1.87 (0.64)[a]	1.86 (0.62)[a]	1.94 (0.65)[a]
Study 1c			
Female participants	2.06 (0.72)	1.77 (0.67)	-----
Study 2			
Female participants	2.15 (0.67)	1.83 (0.64)	-----
Male participants	1.89 (0.62)	1.67 (0.60)	-----

Note. Means that share a superscript (e.g., [a]) are not significantly different from other means on the same row

There was also no effect of physical attractiveness feedback on state anxiety, $F(1, 210) = 2.67$, $p = .104$, $f = .11$, nor an interactive effect of physical femininity feedback and physical attractiveness feedback on state anxiety, $F(2, 210) = 0.09$, $p = .915$, $f = .03$.

Because we sought to determine whether physical femininity threats produced anxiety even in the presence of affirmations of physical attractiveness, we broke down the data by physical attractiveness feedback condition. We found that participants whose physical femininity was threatened reported significantly higher levels of state anxiety than those whose physical femininity was affirmed within both the physical attractiveness control condition ($M = 1.98$, $SD = 0.73$ vs. $M = 1.65$, $SD = 0.70$; $t(79) = -2.03$, $p = .046$, $d = 0.45$) and the physical attractiveness affirmation condition ($M = 1.83$, $SD = 0.58$ vs. $M = 1.56$, $SD = 0.54$; $t(81) = -2.20$, $p = .030$, $d = 0.49$).

For a more conservative analysis, we then re-ran our primary analysis as an analysis of covariance (ANCOVA) with self-perceived physical attractiveness included as a covariate. Controlling for self-perceived physical attractiveness, which significantly predicted state anxiety, $F(1, 209) = 31.86$, $p < .001$, $f = 0.38$, we observed a comparable effect of physical

femininity feedback on state anxiety, $F(2, 209) = 5.43$, $p = .005$, $f = 0.21$. Again, neither physical attractiveness feedback, $F(1, 209) = 0.99$, $p = .320$, $f = 0.06$, nor the interaction between physical femininity feedback and physical attractiveness feedback, $F(2, 209) = 0.18$, $p = .833$, $f = 0.04$, had an effect on state anxiety.[12]

Exploratory Analyses.

Gender identity centrality. Because we were interested in gender identity centrality as a potential moderator of the effect of physical femininity feedback on state anxiety, we first wanted to confirm that the manipulations had no effect on levels of gender identity centrality. We found that neither physical femininity feedback nor physical attractiveness feedback—nor the interaction between the two—had any effect on gender identity centrality (ps > .50). Thus, we conducted an exploratory analysis to determine whether gender identity centrality moderated the effect of physical femininity feedback on state anxiety. We ran a linear regression with physical femininity feedback (dummy coded with affirmation as the reference group) and gender identity centrality (mean-centered) as predictors and state anxiety as the outcome variable. Gender identity centrality did not predict levels of state anxiety, $B = 0.01$, $SE = 0.03$, $p = .651$, 95% Confidence Interval (*CI*) [-0.04, 0.07]. We then added the interactions between these variables to the model. Neither interaction between physical femininity feedback (dummy coded) and gender identity centrality was significant (control vs. affirmation: $B = -0.02$, $SE = 0.08$, $p = .803$, 95% *CI* [-0.17, 0.13]; threat vs. affirmation: $B = 0.11$, $SE = 0.07$, $p = .082$, 95% *CI* [-0.01, 0.24]).

[12] Because the plurality of participants (n=48; 22.22% of the sample) reported no anxiety and thus the distribution of state anxiety was positively-skewed, we also transformed state anxiety into a binary variable with 0=anxiety absent and 1=anxiety present and conducted a binary logistic regression to determine whether physical femininity feedback had an effect on whether participants reported *any* state anxiety. See Supplemental Materials.

Given that we did not power the current study to detect these interactions and that the physical femininity feedback (threat vs. affirmation) x gender identity centrality interaction was in the expected direction, however, we plotted the simple effects that made up this interaction. As shown in Figure 2.1, the effect of physical femininity feedback (threat vs. affirmation) on state anxiety appeared to be driven by participants high in gender identity centrality whose physical femininity was threatened. At low levels of gender identity centrality (1 SD below the mean), there was no effect of physical femininity feedback on anxiety (threat vs. affirmation: $B = 0.15$, $SE = 0.14$, $p = .277$, 95% CI [-0.12, 0.42]; control vs. affirmation: $B = 0.14$, $SE = 0.16$, $p = .408$, 95% CI [-0.19, 0.46]; threat vs. control: $B = 0.01$, $SE = 0.16$, $p = .934$, 95% CI [-0.31, 0.34]). At high levels of gender identity centrality (1 SD above the mean), on the other hand, there *was* an effect of physical femininity feedback on anxiety (threat vs. affirmation: $B = 0.49$, $SE = 0.14$, $p < .001$, 95% CI [0.21, 0.76]; control vs. affirmation: $B = 0.08$, $SE = 0.16$, $p = .624$, 95% CI [-0.23, 0.39]; threat vs. control: $B = 0.41$, $SE = 0.17$ $p = .016$, 95% CI [0.08, 0.74]), such that those whose femininity had been threatened reported higher levels of anxiety than those whose femininity had been affirmed and those who received no feedback on their femininity. Furthermore, although there was no significant effect of gender identity centrality on anxiety among participants in any of the three femininity feedback conditions, among those in the threat condition, this effect was trending in the expected direction, with increasing levels of gender identity centrality predicting increasing levels of anxiety, $B = 0.09$, $SE = 0.05$, $p = .080$, 95% CI [-0.01, 0.20].

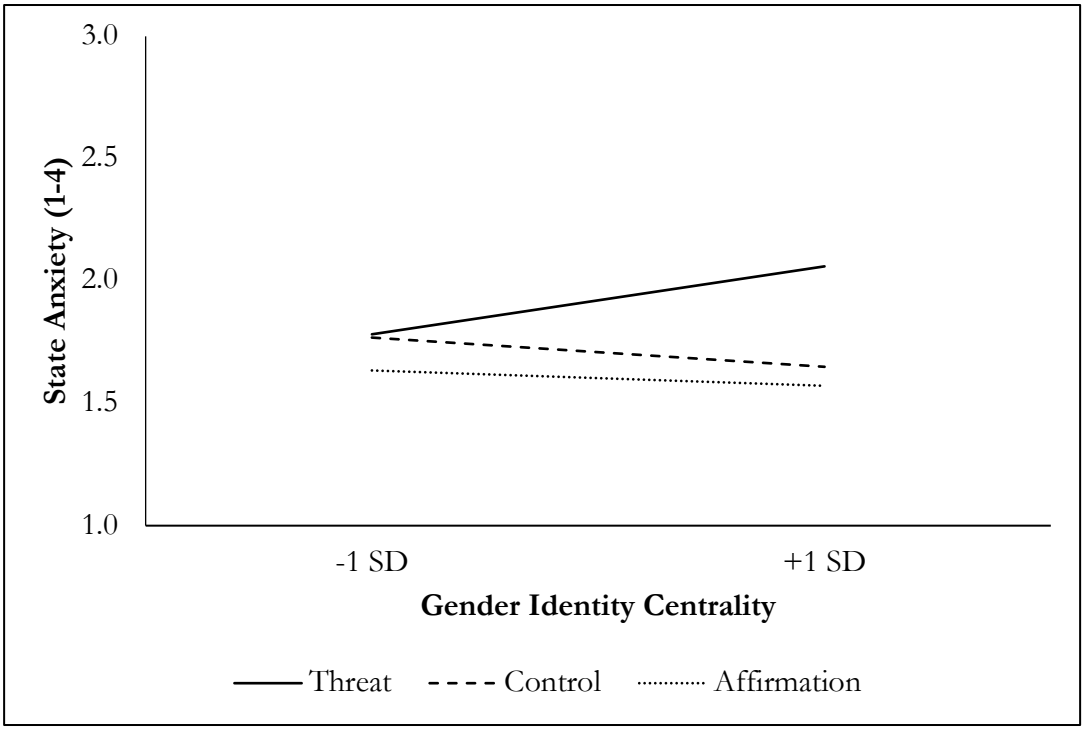

Figure 2.1. State anxiety by femininity feedback condition and gender identity centrality

Perceived controllability of femininity. Again, because we were interested in perceived controllability of femininity as a potential moderator of the effect of physical femininity feedback on state anxiety, we first wanted to confirm that the manipulations had no effect on perceived controllability of femininity. We found that neither physical femininity feedback nor physical attractiveness feedback—nor the interaction between the two—had any effect on perceived controllability of femininity (*p*s > .15). Thus, we conducted an exploratory analysis to determine whether perceived controllability of femininity moderated the effect of physical femininity feedback on state anxiety. We ran a linear regression with physical femininity feedback (dummy coded, again with affirmation as the reference group) and perceived controllability of femininity (mean-centered) as predictors and state anxiety as the outcome variable. Perceived controllability of femininity predicted state anxiety, B = -0.25, SE = 0.06, p < .001, 95% CI [-0.27, -0.14], such that the more participants believed

their femininity was controllable, the less state anxiety they reported (with a 1-point increase in perceived controllability on a 6-point scale predicting a 0.25-point decrease in state anxiety on a 4-point scale). We then added the interactions between these variables to the model. Neither interaction between physical femininity feedback (dummy coded) and perceived controllability of femininity was significant (control vs. affirmation: $B = 0.08$, $SE = 0.14$, $p = .580$, 95% *CI* [-0.20, 0.36]; threat vs. affirmation: $B = 0.08$, $SE = 0.14$, $p = .564$, 95% *CI* [-0.20, 0.37]).

Study 1b

In Study 1a, before receiving feedback on their physical appearance, all participants were presented with lists of the facial features said to play the greatest role in determining the perceived masculinity/femininity and attractiveness of one's appearance. These lists made the bipolar nature of facial femininity and masculinity particularly salient and framed facial femininity as a *lack* of facial masculinity (with, for example, "facial hair" presented as a masculine feature and "does not have facial hair" presented as a feminine feature). The purpose of Study 1b was to test the robustness of the phenomenon established in Study 1a by examining whether the effect of physical femininity feedback on state anxiety replicated when participants were *not* presented with these lists of facial features.

Method

Hypotheses, methods, and analyses for this study were preregistered (see https://osf.io/va2fu/?view_only=45c5120cd4d24e6aae56dd25457bbc56).

Participants and Design. Participants were randomly assigned to one of six conditions in a 3 (physical femininity feedback: affirmation, control, threat) x 2 (physical attractiveness feedback: affirmation, control) design. Participants were recruited through Prolific Academic and paid $1.84 for their participation.

As with Study 1a, we sought to include 244 participants in our final sample. Because we had to exclude 27% of participants from Study 1a, we estimated that 334 participants would need to be recruited to achieve this sample size. Thus, we recruited 334 participants. An additional seven participants ended up completing the study for a total sample size of 341.

Ninety-five participants were excluded because they did not identify as a cisgender female (n=3), did not upload a valid photograph (i.e., did not upload a photograph or uploaded a photograph without any woman or with more than one woman in it; n=7), failed one or more attention checks (which, as in Study 1a, required them to accurately recall the direction of the results they had received—i.e., whether the results indicated that their physical appearance was more or less feminine [and attractive] than average—or whether they had not received any results; n=63), indicated that they intended some of their responses as jokes (n=2), and/or clearly believed that the feedback they received was not produced by image analysis software (as determined by pre-registered criteria, which are described in the Procedure section; n=26). Thus, we were left with a sample size of 246 (M_{age} = 33.37, *SD* =11.16; 72.36% heterosexual; 73.17% White; 9.35% Black; 4.07% Hispanic or Latina; 4.07% East Asian; 0.81% South Asian; 0.41% Native American or Alaskan Native; 8.13 % other or multiracial/ethnic).

Procedure. The procedure was nearly identical to that of Study 1a with a few exceptions. Most critically, whereas participants in Study 1a were presented with lists of the facial features said to play the greatest role in determining the perceived facial masculinity/femininity and attractiveness of one's appearance, participants in Study 1b were not. Also, instead of simply reading about the fictitious image analysis software, participants in Study 1b watched a brief informational video that described it (see Supplemental

Materials). The video provided a more detailed description of how the software was developed (using "deep learning") and used graphics to represent this process. Study 1b also included a series of "beta testing" questions about the software, which were intended to bolster the credibility of the manipulation.

Additionally, Study 1b omitted the measures of gender identity centrality and perceived controllability of femininity, which were included in Study 1a for exploratory purposes and which were not central to the questions being pursued in this follow-up study. It included the measure of state self-esteem (described in the Measures section) that was omitted from Study 1a due to a programming error. For exploratory purposes, it also included a measure of participants' desire to switch their photograph (see Supplemental Materials). This measure was administered following the measures of state anxiety and state self-esteem, as well as the manipulation checks.

Finally, in this study we probed for participant suspicion using a series of pre-registered questions. The first question asked participants to describe their thoughts and/or feelings about their results. The second asked if they had any reservations about their results. If they indicated that they had reservations, they were asked to describe these reservations. They were then asked what they thought the study was testing and were given the opportunity to provide additional comments. These responses were coded for suspicion by two coders using the following coding scheme: 0=no indication of suspicion; 1=participant suspects that the feedback might not have been produced by image analysis software and/or there is some indication that the participant is suspicious; 2=participant seems certain that the feedback was not produced by image analysis software. A two-way random effects model indicated high inter-rater reliability (intraclass correlation coefficient [*ICC*] = .87, 95% *CI* [.76, .85]). Participants were excluded if both coders rated their suspicion level as 2.

Measures. As in Study 1a, the primary dependent variable of interest was state anxiety. A measure of state self-esteem was included as an exploratory dependent variable. Also as in Study 1a, a measure of self-perceived physical femininity was included as a manipulation check, and a measure of self-perceived physical attractiveness was included as both a manipulation check and a covariate. For correlations among all measured variables, see Table 2.3.

Table 2.3
Study 1b Correlation Matrix

Variables	1	2	3	4	5	6
1. State anxiety	--					
2. State self-esteem	-.59***	--				
3. Self-perceived physical attractiveness	-.24***	.50***	--			
4. Self-perceived physical femininity	-.12	.22***	.42***	--		
5. Self-perceived sexual attractiveness[SM]	-.20**	.46***	.84***	.41***	--	
6. Self-perceived attractiveness of personality[SM]	-.13*	.35***	.44***	.34***	.44***	--

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$; SM=Measure and results included as Supplemental Materials

State anxiety. As in Study 1a, participants completed the 6-item short form version of the State-Trait Anxiety Inventory (Marteau & Bekker, 1992). The scale demonstrated high internal reliability ($\alpha = .86$).

State self-esteem. Participants rated their agreement with the following items, taken and modified from the State Self-Esteem Scale (Heatherton & Polivy, 1991) on a scale of 1 (Not at all) to 5 (Extremely): "I feel confident;" "I am worried about how I am regarded;" "I feel satisfied with myself right now;" "I am dissatisfied with myself;" "I feel self-conscious;" "I feel displeased with myself;" "I feel good about myself;" "I am pleased with myself right now;" "I am worried about what other people think of me;" "I feel inferior to others at this moment;" "I feel concerned about the impression I am making." This scale demonstrated high internal reliability ($\alpha = .94$). State self-esteem was highly correlated with state anxiety, $r(244) = -0.59$, $p < .001$.

Self-perceived physical attractiveness. We measured self-perceived physical attractiveness using the single-item, 7-point measure used in Study 1a. As in Study 1a, we also measured self-perceived sexual attractiveness and attractiveness of personality for exploratory purposes (see Supplemental Materials).

Self-perceived physical femininity. We assessed the effectiveness of the physical femininity manipulation by asking participants to rate their physical femininity using the single-item, 7-point scale used in Study 1a.

Results

Manipulation Checks. First, to determine whether we had successfully manipulated self-perceived physical femininity and to examine whether physical attractiveness feedback had any effect on self-perceived physical femininity, we conducted a 3 x 2 between-subjects ANOVA with physical femininity feedback and physical attractiveness feedback as the

independent variables and self-perceived physical femininity as the dependent variable. As intended, there was a main effect of physical femininity feedback on self-perceived physical femininity, $F(2, 240) = 46.30$, $p < .001$, $f = 0.61$, such that participants in the threat condition perceived themselves as less physically feminine ($M = 3.35$, $SD = 1.24$) than those in the control condition ($M = 4.52$, $SD = 1.18$) and participants in the control condition perceived themselves as less physically feminine than those in the affirmation condition ($M = 5.08$, $SD = 1.19$; all Tukey's HSD test ps $< .020$).

There was no effect of physical attractiveness feedback on self-perceived physical femininity, $F(1, 240) = 1.30$, $p = .256$, $f = 0.06$, nor an interactive effect of physical femininity feedback and physical attractiveness feedback on self-perceived physical femininity, $F(2, 240) = 0.15$, $p = .861$, $f = 0.03$.

Next, to determine whether we had successfully manipulated self-perceived physical attractiveness and to examine whether physical femininity feedback had any effect on self-perceived physical attractiveness, we conducted another 3 x 2 between-subjects ANOVA with physical femininity feedback and physical attractiveness feedback as the independent variables and self-perceived physical attractiveness as the dependent variable. Surprisingly, neither physical attractiveness feedback nor physical femininity feedback–nor the interaction between the two–significantly affected self-perceived physical attractiveness, all ps $> .30$.

Self-perceived physical femininity and self-perceived physical attractiveness were moderately to highly correlated, $r(244) = 0.42$, $p < .001$.

Primary Analyses. To determine whether, as predicted, physical femininity feedback had an effect on state anxiety regardless of physical attractiveness feedback, we ran an ANOVA with physical femininity feedback and physical attractiveness feedback as the independent variables and state anxiety as the dependent variable. Contrary to our

hypothesis and in contrast with Study 1a, there was no main effect of physical femininity feedback on state anxiety, $F(2, 240) = 0.34$, $p = .715$, $f = 0.05$ (see Table 2.2 for means). There was, however, a main effect of physical attractiveness feedback on state anxiety, $F(1, 240) = 8.32$, $p = .004$, $f = 0.18$, such that participants in the attractiveness control condition ($M = 2.00$, $SD = 0.63$) reported higher levels of state anxiety than participants in the attractiveness affirmation condition ($M = 1.75$, $SD = 0.60$). There was no interactive effect of physical femininity feedback and physical attractiveness feedback on state anxiety, $F(2, 240) = 1.29$, $p = .276$, $f = 0.10$.

We re-ran this analysis as an ANCOVA, with self-perceived physical attractiveness included as a covariate. Controlling for self-perceived physical attractiveness, which significantly predicted state anxiety, $F(1, 239) = 12.49$, $p < .001$, $f = 0.22$, there was still an effect of physical attractiveness feedback on state anxiety, $F(1, 239) = 7.43$, $p = .007$, $f = 0.17$. Again, neither physical femininity feedback, $F(2, 239) = 0.20$, $p = .822$, $f = 0.04$, nor the interaction between physical femininity feedback and physical attractiveness feedback, $F(2, 239) = 1.10$, $p = .334$, $f = 0.09$, had an effect on state anxiety.[13]

Exploratory Analyses.

State self-esteem. To examine whether physical femininity and/or physical attractiveness feedback influenced levels of state self-esteem, we ran an ANOVA with physical femininity feedback and physical attractiveness feedback as the independent variables and state self-esteem as the dependent variable. There was no main effect of physical femininity feedback, $F(2, 240) = 0.16$, $p = .849$, $f = 0.04$, on state self-esteem (see Table 2.4 for means). There was

[13] As in Study 1a and as preregistered, we also ran a binary logistic regression to determine whether physical femininity feedback had an effect on whether participants reported any state anxiety. See Supplemental Materials.

also no main effect physical attractiveness feedback, $F(1, 240) = 3.13$, $p = .078$, $f = 0.11$, nor an interaction between physical femininity feedback and physical attractiveness feedback, $F(2, 240) = 2.52$, $p = .083$, $f = 0.14$.

Table 2.4
Effects of Feedback about Physical Appearance on State Self-Esteem

	Threat	Affirmation	Control
	M (SD)	M (SD)	M (SD)
Study 1a			
Female participants	-----	-----	-----
Study 1b			
Female participants	4.12 (0.99)[a]	4.15 (0.89)[a]	4.05 (1.03)[a]
Study 1c			
Female participants	3.90 (1.01)	4.24 (0.92)	-----
Study 2			
Female participants	3.75 (0.99)	4.20 (0.92)	-----
Male participants	4.21 (0.91)[a]	4.33 (0.93)[a]	-----

Note. Means that share a superscript (e.g., [a]) are not significantly different from other means on the same row

We then re-ran this analysis as an ANCOVA, with self-perceived physical attractiveness included as a covariate. Controlling for self-perceived physical attractiveness, which significantly predicted state self-esteem, $F(1, 239) = 80.10$, $p < .001$, $f = 0.57$, there was again no main effect of physical femininity feedback, $F(2, 239) = 0.01$, $p = .994$, $f = 0.01$, or physical attractive feedback, $F(1, 239) = 2.18$, $p = .141$, $f = 0.08$, on state self-esteem. Again, there was no interaction between physical femininity feedback and physical attractiveness feedback, $F(2, 239) = 2.53$, $p = .082$, $f = 0.12$.

Study 1c

In Study 1a, in which participants were presented with lists of features said to contribute to perceptions of facial masculinity/femininity and attractiveness, we observed an effect of physical femininity feedback on state anxiety, such that participants whose physical femininity was threatened reported higher levels of state anxiety than those whose physical

femininity was affirmed. In Study 1b, in which participants were *not* presented with these lists of features, we did not see this effect. Thus, the purpose of Study 1c was to reconcile these inconsistent results by systematically manipulating inclusion of these lists of facial features in the experimental set-up and testing whether physical femininity feedback affected levels of state anxiety when these lists of features, which framed physical femininity and masculinity as opposites and femininity as a lack of masculinity, were present but not when they were absent.

Method

Hypotheses, methods, and analyses for this study were preregistered (see https://osf.io/krhqx/?view_only=a4db641c11c2415f84a807852e92813f).

Participants and Design. Participants were randomly assigned to one of four conditions in a 2 (physical femininity feedback: affirmation, threat) x 2 (lists of physical features: present, absent) design. Participants were recruited through Prolific Academic and paid $1.84 for their participation.

In Study 1a, in which all participants were given the lists of features, those whose physical femininity was threatened reported higher levels of state anxiety than those whose physical femininity was affirmed. Because we sought to determine whether excluding these lists of features "knocked out" this main effect, we powered Study 1c to detect an effect half the size of the main effect observed in Study 1a (Ledgerwood, 2019, 2020).[14]

[14] This power analysis was based on an effect size obtained through a preliminary analysis of Study 1a data, which focused on four of the six items in the state anxiety measure and which was completed before the data were fully cleaned ($f = 0.28$), rather than final analyses ($f = .21$).

A power analysis using G*Power (Faul et al., 2007) determined that a sample of N=404 would be needed to detect this interaction with 80% power. We anticipated that 20% of recruited participants would be ineligible, fail an attention check, and/or not upload a valid photograph. (Because participants in this study were only given one type of feedback, we anticipated that fewer people would be excluded for failing the attention check than in Studies 1a and 1b). Therefore, we recruited 505 participants.

Forty-seven participants were excluded because they did not identify as a cisgender female (n=2), did not upload a valid photograph (i.e., did not upload a photograph or uploaded a photograph without any woman or with more than one woman in it; n=9), failed the attention check (which required them to accurately recall whether their results indicated that their physical appearance was more, less, or as feminine as the average female in their age group—or whether they did not receive feedback on the femininity of their physical appearance; n=7), indicated that they intended some of their responses as jokes (n=1), and/or clearly believed that the feedback they received was not produced by image analysis software (n=30). Thus, we were left with a sample size of 458 (M_{age} = 33.43, *SD* = 11.70; 71.18% heterosexual; 72.49% White; 9.39% Black; 4.59% Hispanic or Latina; 4.37% East Asian; 1.53% South Asian; 0.22% Middle Eastern or Arab American; 0.22% Native American or Alaskan Native; 7.21% other or multiracial/ethnic or did not report race/ethnicity). A sensitivity power analysis (G*Power 3.1; Faul et al., 2007) indicated that we were powered to detect an effect of $f = 0.13$ (with 80% power and $\alpha = .05$).

Procedure. The procedure mirrored that of Study 1b, with a few changes. The primary change was that participants in Study 1c were randomly assigned to see (as in Study 1a) or not see (as in Study 1b) lists of the facial features that supposedly play the greatest role in determining the perceived masculinity/femininity of one's appearance

Also, in Study 1c, participants only received feedback on the masculinity/femininity of their facial appearance. They did *not* receive feedback on the attractiveness of their facial appearance. Manipulation checks in Studies 1a and 1b indicated that this feedback did not robustly alter self-perceived physical attractiveness. Furthermore, the reason for including this manipulation was to determine whether threats to physical femininity produce anxiety simply because they constitute implied threats to physical attractiveness. However, physical femininity feedback did not affect self-perceived physical attractiveness in Study 1a or Study 1b. (To ensure that our analyses were maximally conservative, we retained the *measure* of self-perceived physical attractiveness and controlled for this variable in key analyses.)

Additionally, given that in Study 1a, participants in the control condition reported levels of anxiety that fell between (though did not significantly differ from) those in the threat condition and those in the affirmation condition and that our goal was to examine differences in anxiety between women whose physical femininity was threatened and women whose physical femininity was affirmed, we omitted the physical femininity control condition from Study 1c. This omission of a control condition is consistent with previous studies on threats to gender stereotypicality (Vandello et al., 2008).

Finally, additional measures of attributions for results, perceived bipolarity of physical femininity and masculinity, importance of results, and feminine identity centrality, described in the Measures section, were included in Study 1c for exploratory purposes. All exploratory measures were administered following the measure of state anxiety, and all exploratory measures other than state self-esteem were administered following the manipulation checks. We probed for participant suspicion using the same pre-registered questions used in Study 1b. These responses were again coded for suspicion by two coders. A two-way random effects model indicated high inter-rater reliability (intraclass correlation

coefficient [*ICC*] = .82, 95% *CI* [.78, .85]). Participants were again excluded if both coders rated their suspicion level as 2.

Measures. As in Studies 1a and 1b, the primary dependent variable of interest was state anxiety. As in Study 1b, a measure of state self-esteem was included as an exploratory dependent variable. Measures of attributions for results, perceived bipolarity of physical femininity and masculinity, and feminine identity centrality were also included as exploratory dependent variables. A measure of self-perceived physical femininity was included as a manipulation check, and a measure of self-perceived physical attractiveness was included as a covariate. For correlations among all measured variables, see Table 2.5.

Table 2.5
Study 1c Correlation Matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. State anxiety	--												
2. State self-esteem	-.65***	--											
3. Self-perceived physical attractiveness	-.16***	.40***	--										
4. Self-perceived physical femininity	-.22***	.30***	.34***	--									
5. Attribution of results to changeable aspects of appearance	.02	-.06	-.07	-.03	--								
6. Attribution of results to stable aspects of appearance	-.06	.06	.06	.20***	-.01	--							
7. Attribution of results to photograph	.01	-.03	-.03	.06	.30***	.12**	--						
8. Belief that results would change on a day-to-day basis	.06	-.08	-.01	.005	.29***	-.21***	.35***	--					
9. Perceived bipolarity of physical femininity and masculinity	.01	-.012	-.001	.08	.22***	.16***	.12*	.01	--				
10. Importance of results	.10*	-.24***	-.08	.06	.08	.32***	.16***	.02	.30***	--			
11. Feminine identity centrality	.09	-.08	.11*	.25***	.05	.18***	.06	.07	.41***	.47***	--		
12. Self-perceived sexual attractiveness[SM]	-.15**	.37***	.83*	.32***	-.10*	.05	-.03	-.02	-.003	-.08	.11*	--	
13. Self-perceived attractiveness of personality[SM]	-.27*	.42***	.41***	.18***	-.08	.09*	.10*	-.001	-.03	-.03	.05	.41***	--

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$; SM=Measure and results included as Supplemental Materials

State anxiety. As in Studies 1a and 1b, participants completed the 6-item short form version of the State-Trait Anxiety Inventory (Marteau & Bekker, 1992). The scale demonstrated high internal reliability ($\alpha = .89$).

State self-esteem. As in Study 1b, participants rated their agreement with eleven items taken and modified from the State Self-Esteem Scale (Heatherton & Polivy, 1991). This scale demonstrated high internal reliability ($\alpha = .94$). State self-esteem was highly correlated with state anxiety, $r(456) = -0.65$, $p < .001$.

Self-perceived physical attractiveness. We measured self-perceived physical attractiveness using the single-item, 7-point measure used in Studies 1a and 1b. As in Studies 1a and 1b, we also measured self-perceived sexual attractiveness and attractiveness of personality for exploratory purposes (see Supplemental Materials).

Self-perceived physical femininity. We assessed the effectiveness of the physical femininity manipulation by asking participants to rate their physical femininity using the single-item, 7-point scale used in Studies 1a and 1b.

Attributions for results. We were interested in the possibility that to cope with threats to their femininity, women who received feedback indicating that they were less physically feminine than average would make more external, situational attributions for their results than women who received feedback indicating that they were more physically feminine than average (Kinderman & Bentall, 2000). Participants therefore responded to the following questions on a scale of 1 (Not at all) to 7 (Very much): "To what extent do you think the results you received are based on aspects of your physical appearance that you could change if you wanted to?" "To what extent do you think the results you received are based on stable aspects of your physical appearance (R)?" "To what extent do you think the results you received are based on aspects of the specific photograph you uploaded?" "How much do

you think your results would change on a day-to-day basis?" Because these items did not form a reliable scale ($\alpha = .47$), we analyzed each of them separately.

Perceived bipolarity of physical femininity and masculinity. If women only experience anxiety in response to threats to their physical femininity when they have viewed lists of the features said to play the greatest role in determining perceived facial masculinity/femininity, this might be because viewing these lists makes the bipolar nature of physical femininity and masculinity particularly salient (with facial femininity defined largely as a *lack* of facial masculinity). To explore this possibility, we measured perceived bipolarity of physical femininity and masculinity by asking participants to respond to the following question on a scale of 1 (Not at all) to 7 (Very much): "When it comes to physical appearance, to what extent do you think masculinity and femininity are opposites?"

Importance of results. We were also interested in the possibility that to cope with threats to their femininity, women who received feedback indicating that they were less physically feminine than average would downplay the importance of their results (Frey & Stahlberg, 1986; Kashima & Triandis, 1986). We therefore asked participants to rate their agreement, on a scale of 1 (Strongly disagree) to 7 (Strongly agree), with the following statement: "The results I received are important to me."

Feminine identity centrality. Finally, we were interested in the possibility that to cope with threats to their femininity, women who received feedback indicating that they were less physically feminine than average would downplay the centrality of femininity to their overall sense of self. We therefore included a single item from the measure of gender identity centrality used in Study 1a (Luhtanen & Crocker, 1992). Participants rated their agreement, on a scale of 1 (Strongly disagree) to 7 (Strongly agree), with the statement: "Being feminine is an important part of my self image." Although we did not observe an effect of physical

femininity feedback on gender identity centrality in Study 1a, we included this measure for exploratory purposes.

Results

Manipulation Checks. To confirm that we successfully manipulated self-perceived physical femininity and examine whether presence of the lists of physical features affected self-perceived physical femininity, we conducted a 2 x 2 between-subjects ANOVA with physical femininity feedback and lists of physical features as the independent variables and self-perceived physical femininity as the dependent variable. As intended, there was a main effect of physical femininity feedback on self-perceived physical femininity, $F(1, 454) = 150.29$, $p < .001$, $f = 0.57$, such that participants in the affirmation condition perceived themselves as more physically feminine ($M = 5.07$, $SD = 1.21$) than participants in the threat condition ($M = 3.55$, $SD = 1.40$). There was no effect of listing physical features on self-perceived physical femininity, $F(1, 454) = 0.48$, $p = .489$, $f = 0.03$, nor an interactive effect of physical femininity feedback and listing physical features on self-perceived physical femininity, $F(1, 454) = 1.75$, $p = .186$, $f = 0.05$.

Primary Analyses. To determine whether, as predicted, physical femininity feedback had an effect on state anxiety and whether this effect was only present when participants saw lists of physical features that supposedly contribute to overall assessments of facial masculinity/femininity, we ran a 2 x 2 between-subjects ANOVA with physical femininity feedback and lists of physical features as the independent variables and state anxiety as the dependent variable. Consistent with the results of Study 1a, there was a medium-size main effect of physical femininity feedback on state anxiety, $F(1, 454) = 20.52$, $p<.001$, $f = 0.21$, such that participants in the threat condition reported higher levels of state anxiety ($M = 2.06$, $SD = 0.72$) than participants in the affirmation condition ($M = 1.77$, SD

= 0.67) (see Table 2.2 for means from all studies). There was no main effect of listing physical features on state anxiety, $F(1, 454) = 2.55$, $p = .111$, $f = 0.07$. Contrary to our prediction, there was no interactive effect of physical femininity feedback and listing physical features on state anxiety, $F(1, 454) = 0.24$, $p = .622$, $f = 0.02$. Physical femininity feedback had a significant effect on state anxiety when the lists of physical features were present, $F(1, 224) = 7.41$, $p = .007$, $f = 0.18$, and absent, $F(1, 230) = 13.93$, $p < .001$, $f = 0.25$.

For a more conservative analysis, we re-ran this analysis as an ANCOVA, with self-perceived physical attractiveness included as a covariate. Controlling for self-perceived physical attractiveness, which significantly predicted state anxiety, $F(1, 453) = 12.71$, $p < .001$, $f = 0.16$, there was still an effect of physical femininity feedback on state anxiety, $F(1, 453) = 21.28$, $p<.001$, $f = 0.21$. Again, neither listing physical features, $F(1, 453) = 3.57$, $p = .060$, $f = 0.09$, nor the interaction between physical femininity feedback and listing physical features, $F(1, 453) = 0.12$, $p = .724$, $f = 0.02$, had an effect on state anxiety.[15]

Exploratory Analyses.

State self-esteem. To examine whether physical femininity feedback had an effect on state self-esteem and whether if so, this effect was only present when participants saw lists of physical features that supposedly contribute to overall assessments of facial masculinity/femininity, we ran another 2 x 2 between-subjects ANOVA with physical femininity feedback and lists of physical features as the independent variables and state self-esteem as the dependent variable. There was a main effect of physical femininity feedback on state self-esteem (see Table 2.4), $F(1, 454) = 14.91$, $p<.001$, $f = 0.18$, such that participants in the threat condition

[15] As in Studies 1a and 1b and as preregistered, we also ran a binary logistic regression to determine whether physical femininity feedback had an effect on whether participants reported any state anxiety. See Supplemental Materials.

reported lower levels of state self-esteem (M = 3.90, SD = 1.01) than participants in the affirmation condition (M = 4.24, SD = 0.92). There was no main effect of listing physical features on state self-esteem, $F(1, 454) = 0.35$, $p = .552$, $f = 0.03$, nor an interaction between physical femininity feedback and listing physical features, $F(1, 454) = 0.18$, $p = .669$, $f = 0.02$.

For a more conservative analysis, we re-ran this analysis as an ANCOVA, with self-perceived physical attractiveness included as a covariate. Controlling for self-perceived physical attractiveness, which significantly predicted state self-esteem, $F(1, 453) = 93.84$, $p<.001$, $f = 0.45$, the effect of physical femininity feedback on levels of state self-esteem remained significant, $F(1, 453) = 18.56$, $p<.001$, $f = 0.18$. Again, there was no main effect of listing physical features on state anxiety, $F(1, 453) = 1.96$, $p = .162$, $f = .06$, nor an interaction between physical femininity feedback and listing physical features, $F(1, 453) = 0.75$, $p = .387$, $f = 0.04$.

Attributions for results. We conducted a series of 2 x 2 between-subjects ANOVAs to assess the effects of physical femininity feedback, lists of physical features, and the interactions between the two variables on each item. Because we were examining four attribution-related dependent variables, we set the alpha levels to .0125 for these analyses. We found that participants whose physical femininity was affirmed attributed their results to stable aspects of their physical appearance to a greater extent (M = 4.89, SD = 1.41) than participants whose physical femininity was threatened (M = 4.07, SD = 1.55), $F(1, 454) = 35.25$, $p < .001$, $f = 0.28$. Additionally, participants whose physical femininity was affirmed thought their results would change on a day-to-day basis to a lesser extent (M = 3.69, SD = 1.82) than participants whose physical femininity was threatened (M = 4.08, SD = 1.80), $F(1, 454) = 5.60$, $p = .018$, $f = 0.11$, though this result did not achieve statistical significance based on our pre-set alpha level. There was no effect of physical femininity feedback on the extent to

which participants thought the results they received were based on aspects of their physical appearance that they could change if they wanted to, nor on the extent to which they thought the results they received were based on aspects of the specific photograph they uploaded, *p*s > .20. There were no main effects of listing physical features *p*s > .20, nor any interactions between physical femininity feedback and listing physical features, *p*s > .20.

Perceived bipolarity of physical femininity and masculinity. We sought to determine whether participants perceived physical femininity and masculinity as more bipolar when they had viewed lists of the facial features said to play the greatest role in determining facial masculinity/femininity, as compared to when they had not viewed such lists. We also sought to determine whether physical femininity feedback moderated this potential effect. A 2 x 2 between-subjects ANOVA with physical femininity feedback and lists of physical features as the independent variables revealed no main effects of physical femininity feedback, $F(1, 454) = 1.50$, $p = .221$, $f = 0.06$, or listing physical features, $F(1, 454) = 0.64$, $p = .426$, $f = 0.04$, on perceived bipolarity of physical femininity and masculinity. It did, however, reveal a marginally significant interaction between physical femininity feedback and listing physical features, $F(1, 454) = 3.88$, $p = .050$, $f = 0.09$. Among participants whose physical femininity was threatened, perceived bipolarity did not differ between those who saw the lists of features ($M = 4.45$, $SD = 1.45$) and those who did not ($M = 4.28$, $SD = 1.59$), $F(1, 220) = 0.69$, $p = .407$, $f = 0.06$. Surprisingly, among participants whose physical femininity was affirmed, those who saw the lists of features perceived femininity and masculinity as *less* bipolar ($M = 4.34$, $SD = 1.60$) than those who did not ($M = 4.75$, $SD = 1.57$), $F(1, 234) = 3.82$, $p = .052$, $f = 0.13$, though this effect was only marginally significant.

Importance of results. To determine whether participants downplayed the importance of threatening, as compared to affirming, results, and whether listing physical features

moderated this potential effect, we conducted a 2 x 2 between-subjects ANOVA with physical femininity feedback and lists of physical features as the independent variables. This ANOVA revealed a significant effect of physical femininity feedback, such that participants whose physical femininity was affirmed indeed rated the results as more important to them (M = 3.55, SD = 1.76) than participants whose physical femininity was threatened (M = 2.99, SD = 1.70), $F(1, 454) = 12.30$, $p < .001$, $f = 0.16$. This main effect was qualified by a significant two-way interaction, $F(1, 454) = 5.57$, $p = .019$, $f = 0.11$.

Among participants in the lists absent condition, those whose physical femininity was affirmed rated the results as more important to them (M = 3.81, SD = 1.82) than those whose physical femininity was threatened (M = 2.86, SD = 1.57), $F(1, 230) = 18.25$, $p<.001$, $f = 0.28$. Among participants in the lists present condition, those whose physical femininity was affirmed (M = 3.33, SD = 1.68) did not differ from those whose physical femininity was threatened (M = 3.14, SD = 1.85) in their ratings of the results' importance to them, $F(1, 224) = 0.62$, $p = .432$, $f = 0.05$. There was no main effect of listing of physical features, $F(1, 454) = 0.40$, $p = .528$, $f = 0.03$.

Feminine identity centrality. To examine whether participants whose physical femininity was threatened downplayed the importance of femininity to their self-image, as compared to those whose physical femininity was affirmed—and whether this potential effect was moderated by listing physical features, we conducted a 2 x 2 between-subjects ANOVA with physical femininity feedback and lists of physical features as the independent variables and feminine identity centrality as the dependent variable. Neither physical femininity feedback, $F(1, 454) = 2.97$, $p = .086$, $f = 0.08$, nor listing physical features, $F(1, 454) = .005$, $p = .945$, $f = 0.003$, had an effect on femininity identity centrality. There was also no interaction between the two variables, $F(1, 454) = 2.17$, $p = .141$, $f = 0.07$.

Given that we observed no effect of our manipulations on feminine identity centrality and that Study 1a provided some evidence that the effect of physical femininity feedback on state anxiety might be driven by participants high in gender identity centrality, we conducted exploratory analyses to determine whether feminine identity centrality moderated the effects of physical femininity feedback on state anxiety and self-esteem. A linear regression revealed an interaction between physical femininity feedback and feminine identity centrality, $B = 0.12$, $SE = 0.04$, $p = .001$, 95% CI [0.05, 0.20]. As shown in Figure 2.2, at low levels of feminine identity centrality (1 SD below the mean), there was no effect of physical femininity feedback on state anxiety, $B = 0.09$, $SE = 0.09$, $p = .313$, 95% CI [-0.09, 0.27]. At high levels of feminine identity centrality (1 SD above the mean), however, there was an effect of physical femininity feedback on state anxiety, B = 0.51, SE = 0.09, p < .001, 95% CI [0.33, 0.69], such that participants whose femininity had been threatened reported higher levels of anxiety than participants whose femininity had been affirmed. Furthermore, whereas there was no effect of feminine identity centrality on anxiety among participants in the affirmation condition, $B = -0.02$, $SE = 0.03$, $p = .444$, 95% CI [-0.07, 0.03], there was an effect of feminine identity centrality on anxiety among participants in the threat condition, $B = 0.10$, $SE = 0.03$, $p < .001$, 95% CI [0.05, 0.15], with increasing levels of feminine identity centrality predicting increasing levels of anxiety.

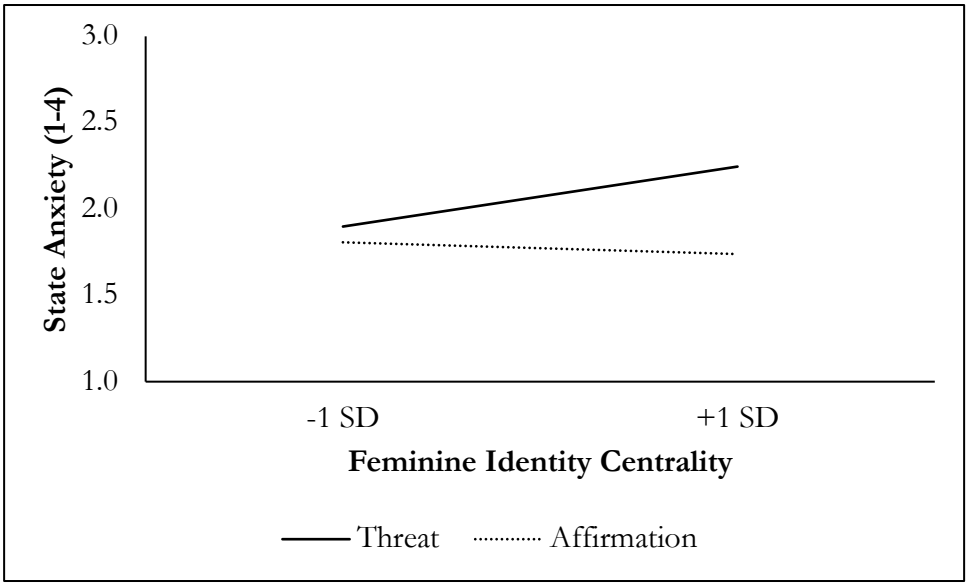

Figure 2.2. State anxiety by femininity feedback condition and feminine identity centrality

Next, we turned to state self-esteem. A linear regression again revealed an interaction between physical femininity feedback and feminine identity centrality, B = -0.20, SE = 0.05, p < .001, 95% CI [-0.30, -0.09]. As shown in Figure 2.3, at low levels of feminine identity centrality (1 SD below the mean), there was no effect of physical femininity feedback on state self-esteem, B = 0.03, SE = 0.13, p = .825, 95% CI [-0.27, 0.22]. At high levels of feminine identity centrality (1 SD above the mean), however, there was an effect of physical femininity feedback on state self-esteem, B = -0.69, SE = 0.13, p < .001, 95% CI [-0.94, -0.44], such that participants whose femininity had been threatened reported lower levels of self-esteem than participants whose femininity had been affirmed. Additionally, whereas there was no effect of feminine identity centrality on self-esteem among participants in the affirmation condition, B = 0.05, SE = 0.04, p = .217, 95% CI [-0.03, 0.12], there was an effect of feminine identity centrality on self-esteem among participants in the threat condition, B = -0.15, SE = 0.04, p < .001, 95% CI [-0.22, -0.08], with increasing levels of feminine identity centrality predicting decreasing levels of self-esteem.

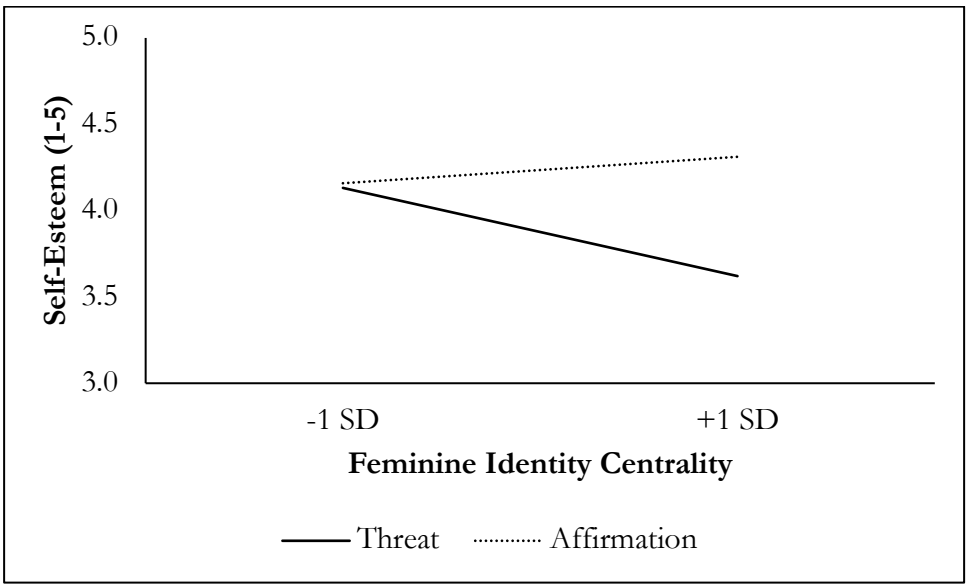

Figure 2.3. State self-esteem by femininity feedback condition and feminine identity centrality

Studies 1a, 1b, & 1c Discussion

Across these studies, we found evidence that cisgender women experience more anxiety in response to threats to their physical femininity than affirmations of their physical femininity and that the effect of physical femininity feedback on anxiety cannot be explained by an assumption that a threat to one's physical femininity constitutes a threat to one's physical attractiveness.

In Study 1a, in which participants were given lists of physical features upon which assessments of physical femininity were said to be based, women whose physical femininity was threatened reported higher levels of state anxiety than cisgender women whose physical femininity was affirmed. This effect held even when participants were told they were highly physically attractive and even when controlling for self-perceived physical attractiveness. Levels of state anxiety among women who received no feedback on their femininity fell between (but did not significantly differ from) levels of state anxiety among women in the

two experimental conditions, suggesting that the effect of physical femininity feedback was driven by *both* women whose physical femininity was threatened *and* women whose physical femininity was affirmed. In other words, affirming feedback and threatening feedback seemed to move women's levels of state anxiety in opposite directions. Exploratory moderation analyses, however, revealed that gender identity centrality predicted levels of anxiety only among women whose physical femininity had been threatened, although this effect did not reach statistical significance. Furthermore, among participants high in gender identity centrality, those whose physical femininity had been threatened experienced heightened levels of anxiety, relative to those who received no feedback on their femininity, whereas those whose physical femininity had been affirmed did *not* experience reduced levels of anxiety, relative to those who received no feedback on their femininity. Together, these results suggest that physical femininity threats, rather than affirmations, may have been particularly influential in producing the observed effect of physical femininity feedback on levels of anxiety.

In Study 1b, in which participants were *not* given lists of physical features upon which assessments of physical femininity were said to be based, women whose physical femininity was threatened *did not* experience higher levels of state anxiety than those whose physical femininity was affirmed. Furthermore, physical femininity feedback had no effect on state self-esteem.

Study 1c sought to reconcile the discrepant results of Studies 1a and 1b by examining whether physical femininity threats only produce anxiety when women are presented with lists of the facial features that supposedly play the greatest role in determining assessments of physical femininity and masculinity and that frame physical masculinity and femininity as opposites (i.e., as two ends of a single spectrum) and femininity as the absence of masculinity

(as in Study 1a but not 1b). Contrary to our prediction, women whose physical femininity was threatened reported higher levels of state anxiety than those whose physical femininity was affirmed regardless of whether they saw these lists of physical features. As in Studies 1a and 1b, physical femininity feedback did not affect self-perceived physical attractiveness, and as in Study 1a, the effect of physical femininity feedback on state anxiety held even when controlling for self-perceived physical attractiveness. Thus, this study provided further evidence that threats to physical femininity in particular—rather than implied threats to physical attractiveness—produce anxiety in women. Furthermore, moderation analyses demonstrated that feminine identity centrality predicted anxiety and self-esteem among women whose femininity had been threatened but not those whose femininity had been affirmed. This study therefore lent further support to the idea that physical femininity threats, rather than physical femininity affirmations, affect levels of anxiety, as well as self-esteem.

Exploratory analyses from Study 1c also revealed a number of results worthy of further investigation. Participants whose physical femininity was threatened reported not only higher levels of state anxiety than those whose physical femininity was affirmed but also lower levels of state self-esteem, even when controlling for self-perceived physical attractiveness, which was highly predictive of state self-esteem. Additionally, women whose physical femininity was threatened attributed their results to stable aspects of their appearance to a lesser extent than those whose physical femininity was affirmed. They also believed, more so than those whose physical femininity was affirmed, that they would get different results on different days. Unsurprisingly, then, women whose physical femininity was threatened viewed their results as less important to them. Together, these results, though exploratory, are suggestive of motivated cognition in the face of threats to gender

stereotypicality. Women may discredit their results as a means a coping with such threats. This explanation is speculative at this point, however, and should be systematically examined in future studies.

Study 2

Studies 1a-c focused exclusively on women and their responses to threats to the femininity of their physical appearances. In Study 2, we expanded our focus to include both women *and* men and threats to both physical *and* psychological gender stereotypicality. In doing so, we sought to determine (i) whether, among women, increased anxiety and reduced self-esteem following gender stereotypicality threats are unique to the domain of physical appearance and (ii) whether increased anxiety and reduced self-esteem following physical gender stereotypicality threats are unique to women.

Past research has demonstrated that women do not experience anxiety in response to threats to their *psychological* femininity (Vandello et al., 2008). However, this past work employed a slightly different paradigm than the one we used and was conducted with a different sample. Therefore, it was unclear whether within the same sample of women and with comparable paradigms we would observe that women indeed experience anxiety—and potentially reduced self-esteem—in response to threats to their *physical* but not their *psychological* femininity.

Furthermore, although studies have examined men's psychological and behavioral responses to threats to their *psychological* masculinity (e.g., Dahl et al., 2015; Willer et al., 2013) and physical strength (Cheryan et al., 2015), they have not, to our knowledge, examined men's responses to threats to the masculinity of their *physical appearance*. Thus, it is unclear whether men, like women, experience anxiety in response to feedback indicating that their physical appearance is less gender stereotypical than average. Is increased anxiety following

physical gender stereotypicality threats, relative to affirmations, a phenomenon unique to women, whose physical appearances are frequently subjected to commentary and critique (Heith, 2003, p. 126), or is this a phenomenon experienced by women and men alike?

Some non-experimental evidence suggests that men may, indeed, experience such anxiety. For example, adolescent boys with high levels of babyfacedness (which largely overlaps with facial femininity; Dinnerstein & Weitz, 1994; Friedman & Zebrowitz, 1992) tend to be colder and more academically competent and to engage in more criminal behavior than peers with more mature (and thus masculine) facial appearances (Zebrowitz, Andreoletti, et al., 1998; Zebrowitz, Collins, et al., 1998). Behaving in a stereotypically masculine manner may be a strategy that babyfaced boys and men use to cope with the anxiety associated with appearing physically feminine. Additionally, when men's psychological masculinity is threatened, they have been shown to not only espouse stereotypically masculine attitudes and behave in a stereotypically masculine manner (Bosson & Vandello, 2011; Glick et al., 2007; Willer et al., 2013) but also to overestimate their height (Cheryan et al., 2015)—that is, to exaggerate one component of their physical masculinity. Together, these findings suggest that men may, indeed, be concerned about appearing physically masculine and may therefore experience anxiety, just as women do, in response to threats to their gender stereotypicality within the domain of physical appearance.

However, psychological and behavioral masculinity may be more heavily prescribed for men than physical masculinity is. In a 2017 nationally representative survey of U.S. adults, participants were asked "what traits society values most in men and women" (Parker et al., 2017). In reference to women, the plurality of responses (35%) referred to physical attractiveness, whereas in reference to men, the plurality (33%) referred to honesty and morality—and only 11% referred to physical attractiveness. Furthermore, research on

precarious manhood has suggested that whereas womanhood is a *physical* status, manhood is a *social* status that is only attained when men behave in a sufficiently masculine manner and take on sufficiently masculine roles—and that can be lost at any moment if men fail to live up to social expectations (Vandello & Bosson, 2013). Finally, unlike physical femininity in women, physical masculinity in men is not consistently associated with ratings of physical attractiveness (Rhodes, 2006). Indeed, in some studies, facially feminine men have been rated as more attractive than facially masculine men (Penton-Voak et al., 2004). If men are invested in appearing physically attractive, then, they may not seek to appear particularly physically masculine. Thus, men may be primarily concerned with being psychologically and behaviorally masculine, rather than with looking masculine, and may experience anxiety in response to threats to the gender stereotypicality of their *personalities* but not their appearances.

The primary goal of Study 2 was to compare women's and men's responses to threats to the gender stereotypicality of their physical appearances and personalities. We predicted that among women, those whose physical femininity was threatened would experience higher levels of state anxiety than those whose physical femininity was affirmed but that those whose psychological femininity was threatened would *not* experience higher levels of state anxiety than those whose psychological femininity was affirmed. We predicted that among men, those whose psychological masculinity was threatened would experience higher levels of state anxiety than those whose psychological masculinity was affirmed. We also predicted that among men, those whose physical masculinity was threatened would not experience higher levels of state anxiety than those whose physical masculinity was affirmed. This latter prediction was more tentative than the others, however, because, as described

earlier, we also had reason to believe that men might, indeed, find threats to their physical masculinity anxiety-provoking.

A secondary goal of Study 2 was to examine a possible mediator of the predicted effects of femininity and masculinity threats on state anxiety (and potentially state self-esteem, as in Study 1c, physical femininity threats, relative to physical femininity affirmations, produced reduced self-esteem in women). Although across Studies 1a-c we found strong evidence that women experience anxiety in response to physical femininity threats, compared to affirmations, we did not explore potential mechanisms underlying this observed effect, and to our knowledge, past research has not explored mechanisms underlying the relationships between masculinity threats and anxiety in men. To fully understand experiences with gender stereotypicality threats and eventually pave the way for interventions to mitigate the harmful consequences of these threats, it is important to determine *why* these threats produce anxiety and possibly reduced self-esteem.

Women and men may experience threats to their femininity and masculinity, respectively, as threats to their identity, and experiences with identity invalidation have been linked to increased stress and anxiety (Albuja et al., 2019; Murray et al., 2012) and reduced self-esteem (Garr-Schultz & Gardner, 2019; Townsend et al., 2009). Thus, we examined felt identity invalidation as a potential mediator of the predicted relationship between gender stereotypicality threat and state anxiety and the possible relationship between gender stereotypicality threat and state self-esteem.

We also explored gender identity as a potential alternative mediator. We did not specifically anticipate that gender identity would vary by condition but sought to consider this possibility, given that gender identity can be contextually dependent (Mehta, 2015).

Mediation analysis cannot directly demonstrate that an effect of gender stereotypicality threat on identity invalidation *causes* increased anxiety or reduced self-esteem (MacKinnon et al., 2007). It can, however, provide preliminary evidence for felt identity invalidation as a mechanism underlying the potential relationships between gender stereotypicality threat and both anxiety and self-esteem. Thus, it is an important starting point for investigations into the psychological mechanisms by which gender stereotypicality threats, relative to affirmations, produce negative psychological consequences.

Method

Hypotheses, methods, and analyses for this study were preregistered (see https://osf.io/shkn3/?view_only=ccfab0f6cc2e426daa91204fc167fd0d).

Participants and Design

This study utilized a 2 (participant gender: female, male) x 2 (domain: physical appearance, personality) x 2 (feedback: affirmation, threat) factorial design. Participants were randomly assigned to a domain condition and a feedback condition. Participants were recruited through Prolific and paid $2.28 for their participation.

We predicted a three-way interaction, such that women would experience anxiety in response to threats to the femininity of their physical appearance but not threats to the femininity of their personality, whereas men would experience anxiety in response to threats to the masculinity of their personality but not threats to the masculinity of their physical appearance. In Study 1c, women whose physical femininity was threatened experienced more anxiety than those whose physical femininity was affirmed. Therefore, to determine whether this effect would be eliminated when the domain switched from physical appearance to personality, we powered our study to detect an effect half the size of the main effect from Study 1c (A. Ledgerwood, personal communication, September 11, 2019; Ledgerwood, 2019,

2020).[16] A power analysis using *G*Power* determined that a sample of N=938 would be needed to detect this interaction with 80% power. We expected the opposite result for men—that those whose masculinity within the domain of personality was threatened would experience more anxiety than those whose masculinity within the domain of personality was affirmed but that this effect would be eliminated when the domain switched from personality to physical appearance. Thus we needed 938 male participants to detect this interaction with 80% power, for a total sample size of 1876. Based on Study 1c, we anticipated that approximately 16% of recruited participants would be ineligible, fail an attention check, and/or not upload a valid photograph. Therefore, we attempted to enroll 2234 participants.

Thirty-five responses were from participants who had already taken the survey, so these responses were excluded, leaving us with an initial sample size of 2199 participants. Six hundred twenty-five participants were then excluded because they did not identify as a cisgender female or male (n=18), did not submit a valid video (n = 358), failed the attention check (which required that they accurately recall whether they received feedback on their physical appearance or their personality and whether that feedback indicated that they were more, less, or as feminine [or masculine] as the average person in their gender and age group; n = 294), dropped out before being assigned to a condition (n = 4), and/or clearly believed that the feedback they received was not produced by video analysis software (n = 87). Thus, we were left with a sample size of 1574 (822 female, 752 male; M_{age} = 31.08, *SD* = 11.00; 76.94% heterosexual; 67.79% White; 8.01% Black; 7.05% Hispanic or Latina; 5.59% East

[16] This power analysis was based on an effect size obtained through a preliminary analysis of Study 1c data, which focused on four of the six items in the state anxiety measure and which was completed before the data were fully cleaned (*f* = 0.18), rather than final analyses (*f* = 0.21).

Asian; 3.30% South Asian; 0.70% Middle Eastern or Arab American; 0.19% Native American or Alaskan Native; 0.13% Native Hawaiian or Pacific Islander; 7.24% other or multiracial/ethnic). The number of exclusions was high but not unreasonably so given that this was an online study in which participants were asked to use an embedded video recorder on their computer. Because the final sample size was smaller than intended, we conducted sensitivity power analyses (G*Power 3.1; Faul et al., 2007), which indicated that we were powered to detect two two-way interactions (in female and male participants) with effect sizes of $f = 0.10$ (with 80% power and $\alpha = .05$).

Procedure

The procedure was similar to that of Study 1c, with a few changes, all of which are noted here. In this study, participants were instructed to record videos, rather than upload photographs, of themselves. Specifically, they were instructed to record a 1-2-minute video in which they introduced themselves as they would to a person they were meeting for the first time. Videos were recorded using an embedded recorder from addpipe.com.

Additionally, because this study sought to compare responses to feedback about one's gender stereotypicality in two distinct domains, participants were told that the software uses a neural network to assess the femininity/masculinity of either one's facial appearance, in the physical appearance condition, or one's personality, in the personality condition, compared to others in one's gender and age group. Participants in this study did *not* see any lists of characteristics that supposedly determine masculinity/femininity.

Finally, Study 2 omitted the measures of desire to change photograph, attributions for results, perceived bipolarity of physical femininity and masculinity, importance of results, and feminine identity centrality, which were included in Study 1c for exploratory purposes. It included new measures of felt identity invalidation and gender identity, described in the

Measures section. We included measures of felt identity invalidation to examine whether they mediated the predicted interactive effects of domain and feedback on state anxiety. We included gender identity to explore it as a potential alternative mediator. The measure of gender identity was distinct from the measures of gender identity *centrality* used in Studies 1a and 1c, as whereas the latter focused on the extent to which being female and/or feminine was central to one's overall sense of self, the former focused on the extent to which one felt female and/or feminine [or male and/or masculine] in the first place. (For example, one might feel very feminine but not think of femininity as an important part of their overall identity.) The measures of both felt identity invalidation and gender identity were administered following the measures of state anxiety and state self-esteem.

We probed for participant suspicion using the same questions used in Studies 1b and 1c. These responses were coded for suspicion by three coders. One coder coded responses from all participants; the other two coders coded responses from half of the participants. Two-way random effects models indicated acceptable inter-rater reliability (ICC_1 = .72, 95% *CI* [.68, .76]; ICC_2 = .75, 95% *CI* [.73, .79]). As in Studies 1b and 1c, participants were excluded if both coders rated their suspicion level as 2.

Measures

As in Studies 1a-c, the primary dependent variable of interest was state anxiety. As in Studies 1b and 1c, a measure of state self-esteem was included as an exploratory dependent variable. Measures of felt identity invalidation and gender identity were also included as exploratory mediators. For correlations among all measured variables, see Tables 2.6 (for female participants) and 2.7 (for male participants).

Table 2.6
Study 2 Correlation Matrix – Female Participants

Variables	1	2	3	4	5	6	7	8	9	10
1. State anxiety	--									
2. State self-esteem	-.67***	--								
3. Felt gender identity invalidation	.35***	-.39***	--							
4. Felt global identity invalidation	.33***	-.39***	.56***	--						
5. Results-identity discrepancy	.29***	-.27***	.29***	.226***	--					
6. Gender identity	-.11**	.08*	-.44***	-.33***	-.13***	--				
7. Self-perceived femininity (within manipulated domain)	-.12***	.11**	-.39***	-.25***	-.18***	.48***	--			
8. Self-perceived physical attractiveness[SM]	-.15***	.34***	-.25***	-.21***	-.08*	.15***	.28***	--		
9. Self-perceived sexual attractiveness[SM]	-.14***	.31***	-.25***	-.22***	-.08*	.15***	.28***	.79***	--	
10. Self-perceived attractiveness of personality[SM]	-.21***	.33***	-.26***	-.28***	-.06	.16***	.20***	.44***	.40***	--

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$; SM=Measure and results included as Supplemental Materials

Table 2.7
Study 2 Correlation Matrix – Male Participants

Variables	1	2	3	4	5	6	7	8	9	10
1. State anxiety	--									
2. State self-esteem	-.66***	--								
3. Felt gender identity invalidation	.35***	-.50***	--							
4. Felt global identity invalidation	.32***	-.44***	.57***	--						
5. Results-identity discrepancy	.21***	-.16***	.17***	.16***	--					
6. Gender identity	-.20***	.32***	-.56***	-.45***	-.05	--				
7. Self-perceived masculinity	-.15***	.26***	-.44***	-.28***	-.14***	.57***	--			
8. Self-perceived physical attractiveness[SM]	-.18***	.36***	-.28***	-.23***	-.05	.25***	.33***	--		
9. Self-perceived sexual attractiveness[SM]	-.19***	.38***	-.30***	-.25***	-.04	.29***	.37***	.84***	--	
10. Self-perceived attractiveness of personality[SM]	-.27***	.35***	-.25***	-.27***	-.04	.22***	.22***	.38***	.40***	--

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$; SM=Measure and results included as Supplemental Materials

State anxiety. As in Studies 1a-c, participants completed the 6-item short form version of the State-Trait Anxiety Inventory (Marteau & Bekker, 1992). The scale demonstrated high internal reliability ($\alpha = .86$).

State self-esteem. As in Studies 1b and 1c, participants rated their agreement with eleven items taken and modified from the State Self-Esteem Scale (Heatherton & Polivy, 1991). This scale demonstrated high internal reliability ($\alpha = .94$). State self-esteem was highly correlated with state anxiety, $r(1571) = -0.67$, $p < .001$.

Felt identity invalidation. We use the term "felt identity invalidation" to refer to the sense that one's internal sense of self or membership in a group of which one considers oneself a part is denied or not recognized by others (Cheryan & Monin, 2005). We measured felt identity invalidation to determine whether it mediated the predicted interactive effects of domain and feedback condition on state anxiety and potentially state self-esteem. Participants rated their agreement with thirteen statements on a scale of 1 (strongly disagree) to 7 (strongly agree). A factor analysis using principal components analysis with varimax rotation, along with an examination of the correlations among all felt identity invalidation items (see Supplementary materials for both), suggested that the felt identity invalidation items tapped into three underlying constructs: (a) felt *gender* identity invalidation (i.e., the extent to which participants felt that their internal sense of femaleness [maleness], womanhood [manhood], and/or femininity [masculinity] was not recognized by others); (b) felt *global* identity invalidation (i.e., the extent to which participants felt that their *overall* internal sense of self was not recognized by others); and (c) results-identity discrepancy (i.e., the extent to which participants felt that the feedback they had received was inconsistent with their sense of self). Specifically, the factor analysis indicated that all of the reverse-scored items that asked about gender identity invalidation loaded onto the first factor, all of the regularly-scored items that asked about

gender identity invalidation loaded onto the second factor, and all of the items that asked about global identity invalidation loaded onto the third factor. The results-identity discrepancy item did not load onto any of these three factors. We did not, however, interpret the first two factors as necessarily conceptually distinct; rather, it seemed possible that the distinction between the reverse-scored and regularly-scored gender identity invalidation items was a result of shared method variance within each of these clusters of items. The correlation matrix revealed that correlations between the reverse-scored and regularly-scored gender identity invalidation items ranged from .34 - .50. We thus deemed them sufficiently correlated to include together in a single scale, which left the felt *global* identity invalidation items and the results-identity discrepancy item to be measured separately.

Felt gender identity invalidation. Participants rated their agreement with the following statements: "I feel validated as a female [male]" (R); "I feel that my identity as a female [male] is recognized by others" (R); "I am concerned that others do not recognize my 'femaleness' ['maleness'];" "I feel validated as feminine [masculine]" (R); "I feel that my identity as feminine [masculine] is recognized by others" (R); "I am concerned that others do not recognize my femininity [masculinity];" "I feel validated as a woman [man]" (R); "I feel that my identity as a woman [man] is recognized by others" (R); "I am concerned that others do not recognize my womanhood [manhood]." These nine items demonstrated high internal reliability ($\alpha = .91$).

Felt global identity invalidation. Participants rated their agreement with the following statements: "I feel that my identity is recognized by others" (R); "I do not feel that other people see me for who I really am;" "Other people's sense of who I am aligns with who I feel I am" (R). These items demonstrated acceptable internal reliability ($\alpha = .75$).

Results-identity discrepancy. Participants rated their agreement with the statement "I feel like the results I received are consistent with my beliefs about who I really am" (R) (adapted from Bosson and colleagues' [2012] measure of threats to belonging and coherence).

Gender identity. We were interested in gender identity as a potential alternative mediator of the predicted interactive effects of domain and feedback on state anxiety and potentially state self-esteem. Participants rated their agreement with the following statements regarding their identity on a scale of 1 (not at all) to 7 (very much so): "I feel like a female [male];" "On the inside, I feel feminine" (reverse-scored for men); "On the inside, I feel masculine" (reverse-scored for women). (Both female and male participants completed the latter two items.) They also rated their agreement with the statement "I feel like a woman [man]," which we included in case participants' level of identification with the term "female [male]" differed from their identification with the term "woman [man]." Measuring gender identity using this sort of scale has precedent in the literature (Ho & Mussap, 2019). These items demonstrated high internal reliability ($\alpha = .83$).

Self-perceived femininity/masculinity. We assessed the effectiveness of the manipulations by asking participants to rate the femininity (for women) or masculinity (for men) of their physical appearance and personality, compared to the average person in their gender and age group, on 7-point scales ranging from "Much less feminine [masculine]" to "Much more feminine [masculine]."

Results

For clarity of presentation, we report only those results that are most relevant to the aims of this study. For example, when main effects are qualified by two-way interactions and two-way interactions are qualified by three-way interactions, only the highest-order interactions are reported. Additional results can be found in the Supplemental Materials.

Manipulation Checks

To analyze the effectiveness of our manipulations, we began by recoding participants' ratings of their gender stereotypicality so that we could analyze female and male participants' ratings together. We recoded male participants' self-perceived masculinity of appearance and female participants' self-perceived femininity of appearance as "self-perceived gender stereotypicality of appearance" and male participants' self-perceived masculinity of personality and female participants' self-perceived femininity of personality as "self-perceived gender stereotypicality of personality." We then further recoded so that the ratings of participants in the appearance condition and participants in the personality condition could be analyzed together. For participants who had received feedback on their appearance, we recoded self-perceived gender stereotypicality of appearance and for participants who had received feedback on their personality we recoded self-perceived gender stereotypicality of personality as "self-perceived gender stereotypicality within the relevant domain."

To confirm that we had successfully manipulated self-perceived gender stereotypicality within the relevant domain, we ran a 2 x 2 ANOVA with domain and feedback as independent variables. This ANOVA revealed the anticipated main effect of feedback, $F(1, 1570)=113.54$, $p < .001$, $f = 0.27$, such that participants in the affirmation condition reported higher levels of gender stereotypicality within the relevant domain ($M = 4.70$, $SD = 1.38$) than participants in the threat condition ($M = 3.96$, $SD = 1.43$). It also revealed an unexpected effect of domain, $F(1, 1570) = 37.67$, $p < .001$, $f = 0.15$, such that levels of self-perceived gender stereotypicality of physical appearance among participants who received feedback on their physical appearance ($M = 4.53$, $SD = 1.40$) were higher than levels of self-perceived gender stereotypicality of personality among participants who

received feedback on their personality (M = 4.12, SD = 1.48). However, there was no interaction between feedback and domain, $F(1, 1570) = 0.01$, $p = .94$, $f = 0.002$, indicating that the effect of the feedback (affirmation vs. threat) did not significantly differ by domain.

Primary Analyses

To test our primary prediction that women would experience anxiety in response to threats to the femininity of their appearance but not their personality and that men would experience anxiety in response to threats to the masculinity of their personality but not their appearance, we conducted a 2 x 2 x 2 ANOVA with participant gender, domain, and feedback as the independent variables.

Although this ANOVA did not reveal a significant participant gender x domain x feedback interaction, $F(1, 1566) = 1.87$, $p = .171$, $f = 0.03$, we broke down our sample by participant gender, as preregistered, because our sample was powered to detect two two-way interactions (one within female participants and one within male participants), rather than a three-way interaction. (Indeed, a sensitivity power analysis [G*Power 3.1; Faul et al., 2007] indicated that we were only powered to detect a three-way interaction with an effect size of f = .07 with 80% power and $\alpha = .05$).

Among male participants, there was no domain x feedback interaction, $F(1, 748) = 1.14$, $p = .286$, $f = 0.04$—only a main effect of feedback, $F(1, 748) = 14.04$, $p < .001$, $f = 0.14$, such that those whose masculinity was threatened reported higher levels of anxiety (M = 1.87, SD = 0.62) than those whose masculinity was affirmed (M = 1.70, SD = 0.62). Surprisingly and contrary to our prediction, further pre-registered analyses revealed that the effect of feedback on anxiety was only significant for participants who received feedback on the masculinity of their appearance, $F(1, 389) = 12.69$, $p < .001$, $f = 0.18$ (see Table 2.2 for

means), though the effect for feedback on the masculinity of their personality was in the predicted direction, albeit not statistically significant, $F(1, 359) = 3.28$, $p = .071$, $f = 0.10$.

Among female participants, we observed the predicted domain x feedback interaction, $F(1, 818) = 8.96$, $p = .003$, $f = 0.10$. Within the domain of physical appearance, participants whose femininity was threatened reported levels of anxiety higher ($M = 2.15$, $SD = 0.67$) than those of participants whose femininity was affirmed ($M = 1.83$, $SD = 0.64$), $F(1, 425) = 26.30$, $p < .001$, $f = 0.25$ (see Table 2.2). Within the domain of personality, there was no effect of feedback, $F(1, 393) = 0.58$, $p = .446$, $f = 0.04$. Within this domain, participants whose femininity was threatened reported levels of anxiety comparable ($M = 1.88$, $SD = 0.68$) to those of participants whose femininity was affirmed ($M = 1.83$, $SD = 0.64$).[17]

Exploratory Analyses

State self-esteem. We conducted another 2 x 2 x 2 ANOVA to examine the effects of participant gender, domain, feedback, and the interactions among these variables on state self-esteem. This ANOVA revealed a three-way interaction, $F(1, 1565) = 5.87$, $p = .016$, $f = 0.06$. There was a significant domain x feedback interaction among female, $F(1, 818) = 14.66$, $p < .001$, $f = 0.13$, but not male, $F(1, 747) = 0.13$, $p = .716$, $f = 0.01$, participants. There was also no main effect of feedback among male participants, $F(1, 747) = 2.05$, $p = .153$, $f = 0.05$. Female participants whose physical femininity was threatened reported lower levels of state self-esteem ($M = 3.75$, $SD = 0.99$) than female participants whose physical femininity was affirmed ($M = 4.20$, $SD = 0.92$), $F(1, 425) = 23.15$, $p < .001$, $f = 0.23$.

[17] As preregistered, we also ran two binary logistic regressions, one for female participants and one for male participants, to examine whether domain, feedback, and/or the interaction between these variables influenced the likelihood that participants would report any state anxiety. See Supplemental Materials.

However, there was no effect of feedback (threat vs. affirmation) on self-esteem among female participants who received feedback on the femininity of their personality, $F(1, 393) = 0.41$, $p = .525$, $f = 0.03$. Means for self-esteem among participants who received feedback on their physical appearance are presented in Table 2.4.

Potential Mediators

One aim of Study 2 was to determine whether felt identity invalidation (in the form of felt gender identity invalidation, felt global identity invalidation, and/or results-identity discrepancy) and/or gender identity could help to explain the effects of gender stereotypicality feedback on state anxiety and state self-esteem. We began by looking at the effects of participant gender, domain, and feedback on the potential mediators.

Felt gender identity invalidation. We conducted a 2 x 2 x 2 ANOVA to examine the potential effects of participant gender, domain, and feedback—and the interactions among these variables—on felt gender identity invalidation. The ANOVA revealed a main effect of feedback, $F(1, 1565) = 26.05$, $p < .001$, $f = 0.13$, such that those whose gender stereotypicality was threatened reported higher levels of felt gender identity invalidation ($M = 2.47$, $SD = 1.24$) than those whose gender stereotypicality was affirmed ($M = 2.17$, $SD = 1.02$).

There was no participant gender x domain x feedback interaction, $F(1, 1565) = 0.07$, $p = .795$, $f = 0.01$—and no domain x feedback interaction among female or male participants (ps > .35).

All other results for felt gender identity invalidation are presented as Supplemental Materials.

Felt global identity invalidation. We also conducted a 2 x 2 x 2 ANOVA to examine the potential effects of participant gender, domain, and feedback—and the interactions among these

variables—on felt global identity invalidation. This ANOVA revealed no significant effects (*p*s > .08). We broke the sample down by gender and found no evidence for domain x feedback interactions among female or male participants (*p*s > .75).

Results-identity discrepancy. We conducted another 2 x 2 x 2 ANOVA to examine the potential effects of participant gender, domain, and feedback—and the interactions among these variables—on participants' sense that the feedback they received was inconsistent their beliefs about who they really are. The ANOVA also revealed a three-way participant gender x domain x feedback interaction, $F(1, 1566) = 9.99$, $p = .002$, $f = 0.07$.

A two-way ANOVA revealed a domain x feedback interaction among male participants, $F(1, 748) = 11.31$, $p < .001$, $f = 0.11$. Among male participants who received feedback on their personality, there was an effect of feedback, $F(1, 359) = 43.73$, $p < .001$, $f = 0.35$, such that those whose gender stereotypicality was threatened felt a greater discrepancy between their results and identity ($M = 3.97$, $SD = 1.82$) than those whose gender stereotypicality was affirmed ($M = 2.78$, $SD = 1.59$). There was an even stronger effect of feedback among male participants who received feedback on their appearance, $F(1, 389) = 157.90$, $p < .001$, $f = 0.64$, such that again, those whose gender stereotypicality was threatened felt a greater discrepancy between their results and identity ($M = 4.43$, $SD = 1.72$) than those whose gender stereotypicality was affirmed ($M = 2.44$, $SD = 1.40$).

Another two-way ANOVA revealed an even stronger domain x feedback interaction among female participants, $F(1, 818) = 68.77$, $p < .001$, $f = 0.25$. Among female participants who received feedback on their personality, there was an effect of feedback, $F(1, 393) = 24.09$, $p < .001$, $f = 0.25$, such that those whose gender stereotypicality was threatened felt a greater discrepancy between their results and identity ($M = 3.51$, $SD = 1.83$) than those whose gender stereotypicality was affirmed ($M = 2.66$, $SD = 1.62$). There was an even

stronger effect of feedback among female participants who received feedback on their appearance, $F(1, 425) = 373.44$, $p < .001$, $f = 1.07$, such that those whose gender stereotypicality was threatened felt a greater discrepancy between their results and identity ($M = 4.84$, $SD = 1.59$) than those whose gender stereotypicality was affirmed ($M = 2.15$, $SD = 1.25$).

All other results for felt results-identity discrepancy are presented as Supplemental Materials.

Gender identity. We were also interested in gender identity as a potential alternative mediator of the effects of feedback (threat vs. affirmation) on state anxiety and state self-esteem. We conducted a 2 x 2 x 2 ANOVA to analyze the effects of participant gender, domain, and feedback—and the interactions among these variables—on gender identity.

This ANOVA revealed a main effect of feedback, $F(1, 1565) = 5.80$, $p = .016$, $f = 0.06$, such that participants whose gender stereotypicality was affirmed reported a more gender-congruent gender identity ($M = 6.01$, $SD = 0.97$) than those whose gender stereotypicality was threatened ($M = 5.89$, $SD = 1.01$). No other effects were significant (ps $> .08$).

For exploratory purposes, we broke down the sample by gender and found no evidence for an effect of feedback, $F(1, 748) = 0.32$, $p = .571$, $f = 0.02$, or a domain x feedback interaction, $F(1, 748) = 0.07$, $p = .796$, $f = 0.01$, among male participants. There was, however, evidence for an effect of feedback among female participants, $F(1, 817) = 8.12$, $p = .004$, I= 0.10, such that those whose femininity was affirmed reported a more gender-congruent gender identity ($M = 6.06$, $SD = 1.01$) than those whose femininity was threatened ($M = 5.87$, $SD = 1.02$). There was also some evidence for a domain x feedback interaction among female participants, though this effect did not reach statistical

significance, $F(1, 817) = 3.57$, $p = .059$, $f = 0.07$. There was no effect of feedback on gender identity among women who received feedback on their physical appearance, $F(1, 424) = 0.48$, $p = .490$, $f = 0.03$. There was, however, an effect of feedback on gender identity among woman who received feedback on their personality, $F(1, 393) = 10.83$, $p = .001$, $f = 0.17$, such that those whose femininity was affirmed reported a more gender-congruent gender identity ($M = 6.04$, $SD = 0.96$) than those whose femininity was threatened ($M = 5.71$, $SD = 1.06$).

Finally, we looked separately at the effects of feedback on each of the four items in the gender identity measure. We did not observe effects of masculinity feedback on any of these items among men who received feedback on their physical appearance or men who received feedback on their personality. Similarly, we observed no effects of femininity feedback among women who received feedback on their physical appearance. We did, however, observed effects of femininity feedback on all four items among women who received feedback on their personality. Descriptive statistics for women in each of the four conditions are reported in Table 2.8.

Table 2.8
Effects of Femininity Feedback on Gender Identity

	Physical appearance			Personality		
	Threat	Affirmation		Threat	Affirmation	
	M (SD)	M (SD)	*p*	M (SD)	M (SD)	*p*
I feel like a female.	6.31 (1.08)	6.38 (1.08)	.485	6.09 (1.22)	6.41 (1.02)	.005
I feel like a woman.	6.17 (1.18)	6.20 (1.19)	.807	5.98 (1.27)	6.30 (1.06)	.006
On the inside, I feel feminine.	5.80 (1.35)	5.91 (1.27)	.368	5.34 (1.48)	5.71 (1.39)	.011
On the inside, I feel masculine. (R)	5.76 (1.32)	5.81 (1.33)	.670	5.42 (1.49)	5.75 (1.32)	.020

Mediation Analyses

Of the four potential mediators (felt gender identity invalidation, felt global identity invalidation, results-identity discrepancy, and gender identity), the one with a pattern of results most similar to that of state anxiety (and self-esteem, in women) was results-identity discrepancy. Therefore, we ran a series of analyses using the PROCESS Macro for SPSS (Hayes, 2013a, 2013b) to determine whether results-identity discrepancy mediated (i.e., helped to statistically explain) the interactive effects of domain and feedback on both state anxiety and state self-esteem in female participants and the main effect of feedback on state anxiety in male participants. We used bootstrapping with 5,000 samples to estimate bias corrected confidence intervals for the indirect effects.

We began by looking at female participants and tested a moderated mediation model (Model 7) with feedback (threat=1, affirmation=0) as the predictor variable, state anxiety as the outcome variable, results-identity discrepancy as the mediator, and domain (appearance=1, personality=0) as a moderator of the effect of feedback on results-identity discrepancy. We observed indirect effects of feedback on anxiety through results-identity

discrepancy among both participants who received feedback on their appearance and participants who received feedback on their personality, but this indirect effect was stronger for those in the appearance condition (*B* = 0.27, 95% *CI* [0.19, 0.34]) than those in the personality condition (*B* = 0.08, 95% *CI* [0.05, 0.13]), supporting moderated mediation (*B* = 0.18; 95% *CI* [0.12, 0.26]). Within the domain of physical appearance, switching from affirming to threatening feedback resulted in a 0.27-point increase in anxiety on a 4-point scale, mediated by results-identity discrepancy. Within the domain of personality, switching from affirming to threatening feedback resulted in a 0.08-point increase in anxiety on a 4-point scale, mediated by results-identity discrepancy. There was no direct effect of feedback on state anxiety (*B* = 0.02, 95% *CI* [-0.08, 0.12]), indicating that results-identity discrepancy fully accounted for the effects of feedback on anxiety.

We then conducted these analyses with state self-esteem, rather than state anxiety, as the outcome variable. We observed indirect effects of feedback on self-esteem through results-identity discrepancy among both participants who received feedback on their appearance and participants who received feedback on their personality, but this indirect effect was stronger for those in the appearance condition (*B* = -0.38, 95% *CI* [-0.51, -0.28]) than those in the personality condition (*B* = -0.12, 95% *CI* = -0.19, -0.07), again supporting moderated mediation (*B* = -0.26; 95% *CI* [-0.38, -0.17]). Within the domain of physical appearance, switching from affirming feedback to threatening feedback resulted in a 0.38-point reduction in self-esteem on a 5-point scale, mediated by results-identity discrepancy. Within the domain of personality, switching from affirming feedback to threatening feedback resulted in a 0.12-point reduction in self-esteem on a 5-point scale, mediated by results-identity discrepancy. As with state anxiety, there was no direct effect of feedback on

state self-esteem (*B* = 0.05, 95% *CI* [-0.09, 0.20]), indicating that results-identity discrepancy fully accounted for the effects of feedback on self-esteem.

We next turned to male participants. Because male participants showed a main effect of feedback on state anxiety but no moderation of this effect by domain, we tested a simple mediation model (Model 4) with feedback as the predictor variable, state anxiety as the outcome variable, and results-identity discrepancy as the mediator. We observed an indirect effect of feedback on anxiety through results-identity discrepancy (*B* = 0.10, 95% *CI* [0.05, 0.15]), supporting mediation. Switching from affirming feedback to threatening feedback resulted in a 0.10-point increase in anxiety on a 4-point scale, mediated by results-identity discrepancy. There was no direct effect of feedback on state anxiety (*B* = 0.07, 95% *CI* [-0.03, 0.17]), indicating that results-identity discrepancy fully accounted for the effect of feedback on self-esteem.

Because we had not observed an effect of feedback on state self-esteem among male participants, we did not further probe this relationship.

Discussion

Study 2 replicated and extended the results of Studies 1a and 1c by comparing women's and men's psychological responses to gender stereotypicality threats within the domains of physical appearance and personality. As predicted, women experienced greater state anxiety when the femininity of their physical appearance, but not their personality, was threatened than when it was affirmed. Contrary to our prediction that men would show the opposite pattern of results for state anxiety—that is, that they would experience heightened anxiety when the masculinity of their personality, but not their appearance, was threatened—we found that men experienced state anxiety in response to masculinity threats across domains. Surprisingly, when we broke down the results by domain (as pre-registered), we

observed that the effect of feedback on anxiety was only truly significant among men who received feedback on their physical appearance (though it was also marginally significant among men who received feedback on their personality). This result should be interpreted with caution, however, as there was no interaction between feedback and domain among men—only a main effect of feedback.

Additionally, women experienced lower levels of state self-esteem when the femininity of their physical appearance, but not their personality, was threatened than when it was affirmed. Unlike women, men did not report different levels of state self-esteem when their masculinity was threatened versus when it was affirmed.

A secondary goal of Study 2 was to examine potential mediators of the effects of gender stereotypicality feedback on state anxiety and state self-esteem in women and state anxiety in men. We considered felt gender identity invalidation, felt global identity invalidation, results-identity discrepancy, and gender identity. We found that those whose gender stereotypicality was threatened reported higher levels of felt gender identity invalidation and less gender-congruent gender identities than those whose gender stereotypicality was affirmed.

We also found that among both female and male participants, those whose gender stereotypicality was threatened reported a discrepancy between their results and their sense of self across domains, though this effect was stronger among those who had received feedback on their appearance than those who had received feedback on their personality. This difference between domains was particularly strong among female participants. Because this pattern of results mirrored that for state anxiety (and state self-esteem, in women), we tested results-identity discrepancy as a mediator of the relationships between feedback and both state anxiety and state self-esteem. We found evidence that among women, the effect

of feedback on results-identity discrepancy, moderated by domain, mediated the effects of feedback on both state anxiety and state self-esteem. We also found evidence that among men, the effect of feedback on results-identity discrepancy mediated the effect of feedback on state anxiety.

The results of Study 2 demonstrate that both women and men experience anxiety in response to threats to the gender stereotypicality of their appearances. Furthermore, these results demonstrate that whereas for men, the effect of masculinity threat on anxiety extends across domains (both personality and physical appearance), for women, the effect of femininity threat on anxiety is limited to the domain of physical appearance. For both women and men, however, the effect of gender stereotypicality threat on anxiety is stronger within the domain of physical appearance than the domain of personality.

These results also demonstrate that threats to femininity of physical appearance, but not femininity of personality, produce reduced self-esteem in women. Threats to masculinity in either domain, however, do not produce reduced self-esteem (or at least self-reported self-esteem) in men, potentially because self-esteem is considered a masculine trait (Prentice & Carranza, 2002) and thus assertions of self-esteem may serve to restore men's sense of masculinity in the wake of such threats (Bosson et al., 2009).

Finally, the results of Study 2 provide preliminary evidence that a sense of identity invalidation—and specifically, the feeling that the feedback one received does not align with one's sense of self—may help to explain the negative psychological consequences (increased state anxiety and reduced state self-esteem) of gender stereotypicality threats.

Internal Meta-Analysis

Because we observed the predicted effect of physical femininity feedback on state anxiety among women in Studies 1a, 1c, and 2, but not Study 1b, we conducted an internal

meta-analysis to assess the robustness of this effect across the four studies (Fabrigar & Wegener, 2016). We used the procedures outlined by Goh and colleagues (2016) to calculate mean effect size (Cohen's *d*). For Studies 1a and 1b, we limited our analyses to participants in the physical femininity affirmation and threat conditions and collapsed across physical attractiveness feedback conditions. For Study 1c, we collapsed across lists of physical features (present and absent) conditions. As depicted in Figure 2.2, across the four studies, we found a main effect of physical femininity feedback on state anxiety among women, $d = 0.38$, $Z = 6.74$, $p < .001$, 95% *CI* [0.27, 0.50], such that women whose physical femininity was threatened reported higher levels of state anxiety than women whose physical femininity was affirmed.

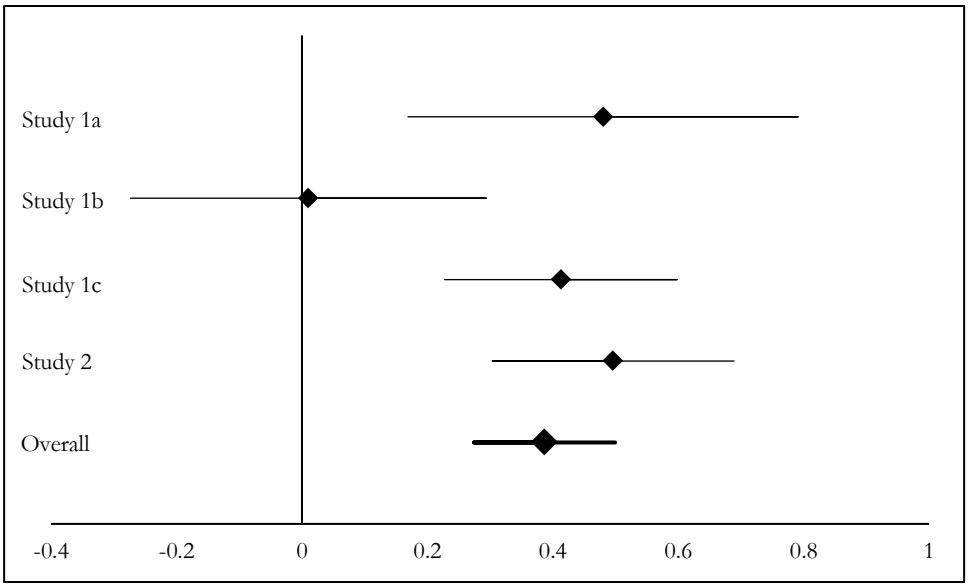

Figure 2.2. Effect sizes (Cohen's d) for the effect of physical femininity feedback on state anxiety among women across studies. Error bars represent 95% confidence intervals.

Because we also observed an effect of physical femininity feedback on state self-esteem among women in Studies 1c and 2, but not Study 1b, we conducted an internal meta-analysis to assess the robustness of this effect across the three studies in which state self-

esteem was measured. As depicted in Figure 2.3, across these three studies, we found a main effect of physical femininity on state self-esteem among women, d = -0.34, Z = -5.55, p < .001, 95% *CI* [-0.46, -0.22], such that women whose physical femininity was threatened reported lower levels of state self-esteem than women whose physical femininity was affirmed.

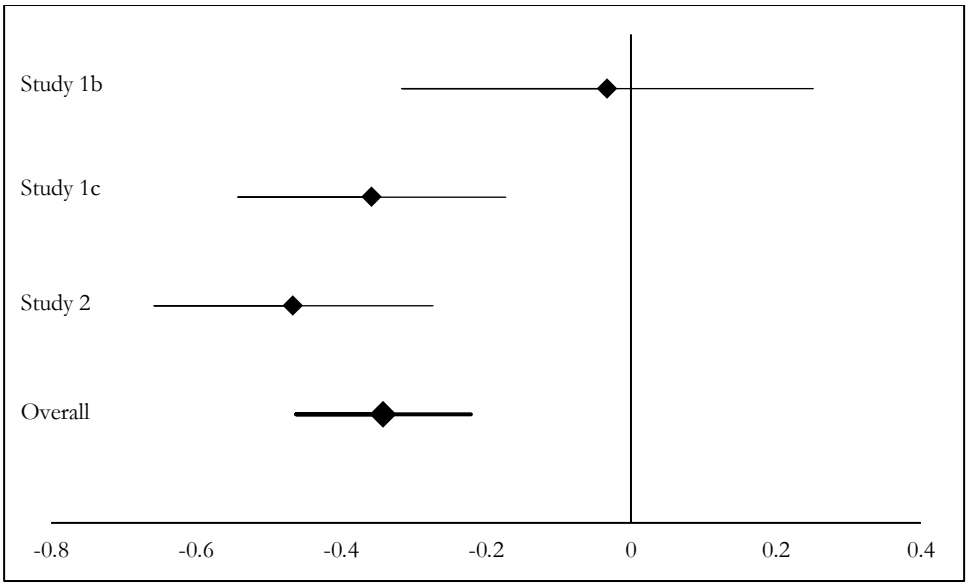

Figure 2.3. Effect sizes (Cohen's d) for the effect of physical femininity feedback on state self-esteem among women across studies. Error bars represent 95% confidence intervals.

For exploratory purposes, we also conducted internal meta-analyses to determine whether there was any evidence that physical femininity feedback affects state anxiety or self-esteem among non-heterosexual women, who are often rated as more physically masculine than heterosexual women (Johnson et al., 2007; Lyons et al., 2014; Rieger et al., 2010) and who may be more likely than heterosexual women to have an intentionally masculine gender presentation (Halberstam, 1996; Rubin, 2006). Sensitivity power analyses indicated that we could detect effect sizes of d = 0.30 for anxiety and d = 0.31 for self-esteem with 80% power. As depicted in Figure 2.4, across the four studies, we observed a

main effect of physical femininity feedback on state anxiety among non-heterosexual women (n = 351), $d = 0.25$, $Z = 3.19$, $p = .001$, 95% *CI* [0.13, 0.56], such that those whose physical femininity was threatened reported higher levels of state anxiety than women whose physical femininity was affirmed.

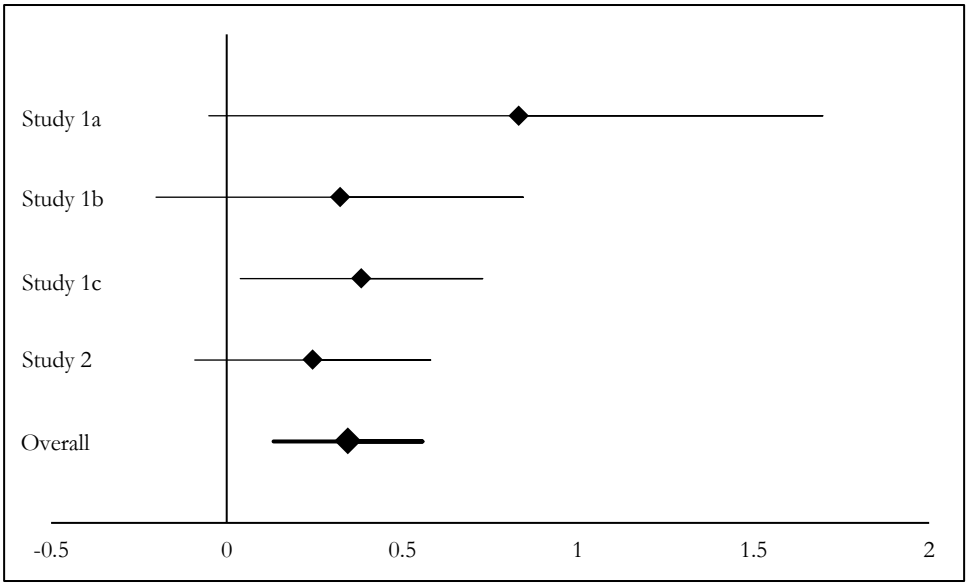

Figure 2.4. Effect sizes (Cohen's d) for the effect of physical femininity feedback on state anxiety among non-heterosexual women across studies. Error bars represent 95% confidence intervals.

As depicted in Figure 2.5, we also observed a main effect of physical femininity feedback on state self-esteem among non-heterosexual women (n = 328), $d = -0.43$, $Z = -3.82$, $p < .001$, 95% *CI* [-0.65, -0.21], such that women whose physical femininity was threatened reported lower levels of state self-esteem than women whose physical femininity was affirmed.

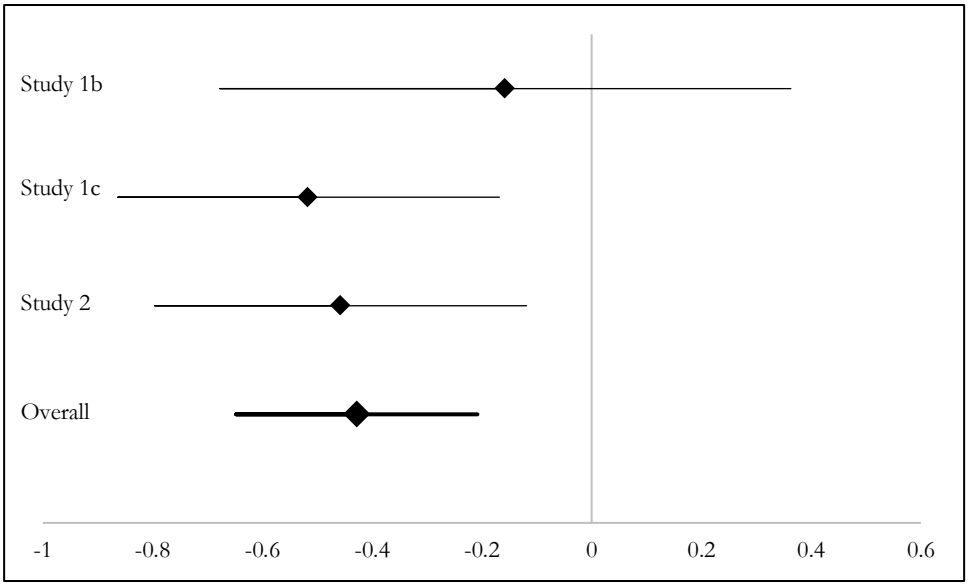

Figure 2.5. Effect sizes (Cohen's d) for the effect of physical femininity feedback on state self-esteem among non-heterosexual women across studies. Error bars represent 95% confidence intervals.

General Discussion

Past research has suggested that whereas men experience increased anxiety in response to threats to their masculinity, women do not experience increased anxiety in response to threats to their femininity (Vandello et al., 2008). That research, however, focused on threats to *psychological* masculinity and femininity. In the current studies, we examined whether women experience anxiety in response to threats to their physical femininity.

Across these studies, women indeed experienced higher levels of anxiety when the femininity of their physical appearance was threatened than when it was affirmed (Studies 1a, 1c, & 2). Whereas threats to physical femininity appeared to produce increases in anxiety (relative to control), affirmations of physical femininity appeared to produce reductions in anxiety (Study 1a). Although we did not observe an effect of physical femininity feedback on

levels of state anxiety in Study 1b, results from an internal meta-analysis revealed that this effect was robust across the four studies.

Furthermore, we found evidence that this heightened anxiety was not a product of the threat to physical *attractiveness* that a threat to physical femininity might be thought to represent. In other words, women found threats to physical femininity to be anxiety-inducing in and of themselves. Additionally, the effect of physical femininity feedback on state anxiety was not contingent upon participants being given explicit information about the physical features upon which judgments of physical femininity and masculinity are based (Study 1c). Threats to physical femininity were anxiety-inducing regardless of whether or not participants were given information about what constitutes physical femininity.

We also found evidence across these studies that in addition to producing increased anxiety, threats to physical femininity, relative to affirmations of physical femininity, produce reductions in self-esteem among women (Studies 1c & 2 and internal meta-analysis with Studies 1b, 1c, & 2).

Furthermore, we found initial evidence that women who receive feedback indicating that they are less physically feminine than average may be less inclined than those who receive feedback indicating that they are more physically feminine than average to view this feedback as important and stable (Study 1c). These results are preliminary, however, and must be replicated before any firm conclusions can be drawn from them.

Additionally, in Study 2, which compared women's and men's psychological responses to feedback on the gender stereotypicality of their physical appearances and personalities, we found evidence that whereas men experience anxiety in response to gender stereotypicality threats across two different domains (physical appearance and personality), women's anxiety response is limited to gender stereotypicality threats within the domain of

physical appearance. We also found evidence that whereas threats to physical femininity, relative to affirmations of physical femininity, produce reduced self-esteem in women, neither threats to physical masculinity nor threats to masculinity of personality produce reduced self-esteem in men. Explaining this gender difference in the effects of gender stereotypicality feedback on self-esteem would require more research. Given that having high self-esteem is a gender-intensified prescriptive stereotype for men (Prentice & Carranza, 2002), it is possible that for men, assertions of self-esteem serve as a form of compensation—that is, a means of restoring their sense of masculinity after it has been threatened. This explanation is speculative, however, and must be explored further before any conclusions about the reasons for this gender difference can be drawn.

Study 2 also provided preliminary evidence that a feeling of identity invalidation—and more specifically, a discrepancy between the feedback one received and one's beliefs about who one really is—may explain why gender stereotypicality threats within the domain of physical appearance induce anxiety and reduced self-esteem in women and why gender stereotypicality threats across domains induce anxiety in men. This finding is consistent with past research on consequences of identity invalidation (Albuja et al., 2019; Murray et al., 2012) and, as discussed later in this section, should be explored in more depth in future work.

Given that the only effects we consistently tested and observed across studies were those of physical femininity feedback on state anxiety and state self-esteem, we focus on these consistent findings throughout the remainder of our discussion. These findings present a challenge to the notion that unlike men, women do not experience anxiety in response to threats to their gender stereotypicality. They suggests that women may not, in fact, be less concerned with being feminine than men are with being masculine. Rather, whereas men

seem to be concerned with achieving and maintaining masculinity across domains (i.e., in terms of both personality and appearance), women may be concerned with achieving and maintaining femininity within the domain of physical appearance in particular.

At a theoretical level, the current results broaden prevailing understandings of gender stereotypes—and of femininity in particular. Although nearly forty years ago, Deaux and Lewis (1984) suggested that gender stereotypes comprise four domains—personality traits, role behaviors, occupations, and physical appearance—the majority of the literature on gender stereotypes has continued to focus primarily (albeit not exclusively) on psychological forms of gender stereotypes. Studies on *threats* to gender stereotypicality in particular have given participants feedback on their masculinity and femininity on the basis of their knowledge, personality, interests, or task performance (Frederick et al., 2017; Hunt et al., 2016; Lee-Won et al., 2017; Rudman & Fairchild, 2004). Thus, the conclusions that have been drawn from these studies are limited by their focus on one domain of gender stereotypicality. Given our finding that women do indeed experience anxiety—and reduced self-esteem—in response to threats to the gender stereotypicality of their *physical appearances*, the current studies serve as a call to gender researchers to expand the scope of their inquiry to include all four domains of stereotypes that Deaux and Lewis proposed (1984). Furthermore, they suggest that research on appearance-related gender stereotypes should move beyond a focus on physical attractiveness (Prentice & Carranza, 2002) to a broader examination of the pressure on women to appear feminine.

Although the current studies present a new perspective on the previous finding that men, but not women, experience anxiety in response to threats to their gender stereotypicality and suggest that women *do* indeed experience such anxiety, as well as reduced self-esteem, our findings should *not* be interpreted as disputing other theories and evidence

that have sought to explain this earlier finding. Our results are not, for example, inconsistent with previous accounts suggesting that manhood but not womanhood is a precarious social status (Vandello & Bosson, 2013), that masculinity within the domains of personality, role behaviors, and occupations is higher status than femininity (Feinman, 1981), or that femininity in men is more associated with presumptions of same-gender sexual orientation than masculinity in women is (McCreary, 1994). Nor, however, do our results directly support any of these accounts. Rather, they exist in parallel with previous explanations for men and women's discrepant responses to feedback indicating that they are counter-stereotypical.

At a practical level, the current findings help to elucidate the lived experiences of women by pointing to a previously underexplored contributor to anxiety and low self-esteem in women. They may also help to explain the great deal of resources—in terms of both time (Today/AOL, 2014) and money (Harris Poll, 2014)—that women spend on femininity work, including facial hair removal (Toerien et al., 2005) and cosmetic application (Today/AOL, 2014). Thus, these results have the potential to inform interventions that can improve women's psychological well-being. Specifically, they suggest that discussion of the pressure on women to appear physically feminine and the negative psychological consequences of believing one is physically counter-stereotypical should be incorporated into guidelines for clinical practice with women (American Psychological Association, Girls and Women Guidelines Group, 2018), just as the pressure on men to act in a sufficiently masculine manner is addressed in guidelines for clinical practice with men (American Psychological Association, Boys and Men Guidelines Group, 2018). The current results also suggest that beyond contributing to women's insecurities about body shape and size (Grabe et al., 2008),

advertisements for beauty products and procedures—such as hair removal and cosmetics—may reinforce women's anxiety about not appearing sufficiently feminine.

Although the current work has a number of important theoretical and practical implications, it also has several limitations that highlight key areas for future research. First, our samples consisted primarily of White women (69%-81%). Thus we cannot assume that the results from these studies would generalize to women of color. In fact, given that racial stereotypes are highly gendered (Galinsky et al., 2013; Goff et al., 2008) and that definitions of femininity in the United States are highly Eurocentric (Cole, 2009; Collins, 2004), we would expect women's responses to threats to their femininity to vary as a function of race. Black women are thought of by many as non-prototypical women (Thomas et al., 2014) and are often perceived as more physically masculine than White women (Goff et al., 2008; Lei et al., 2020). Thus, they likely experience more chronic threats to their femininity than women of other racial groups do. Black women might therefore be sensitized to these sorts of threats—and thus especially affected by them. On the other hand, they might be *desensitized* to these sorts of threats—and thus especially resistant to their negative consequences. Indeed, evidence suggests that on average Black women are more satisfied with their appearances than White women are (Jefferson & Stake, 2009; York-Crowe & Williamson, 2005). Because across the current studies only 103 Black women received feedback on the femininity of their physical appearance, we did not have adequate power to determine whether this feedback affected their levels of anxiety (we could detect $d = 0.55$ with 80% power) or self-esteem (we could detect $d = 0.60$ with 80% power). Future research should recruit a more racially diverse sample and oversample Black women to examine how women of different races respond to threats to their physical femininity. Future research should also recruit a sample that is more diverse in terms of age, as the mean age for participants in the

current studies ranged from 33-37. Given the large overlap in what constitutes a "feminine" appearance and a "youthful" appearance (Dinnerstein & Weitz, 1994; Friedman & Zebrowitz, 1992), we might also expect to see different responses to physical femininity threats among women who are older and who might therefore also face more chronic threats to their femininity. Future research with more diverse samples would benefit from the use of alternative paradigms, however, as threatening the femininity of women whose femininity is chronically threatened could cause undue—albeit temporary—psychological distress.

The current research is also limited by its focus on facial appearances. There are numerous distinct elements of physical gender stereotypicality, including, but not limited to facial appearance, overall appearance, hair style, amount of body hair, and body shape (Aube et al., 1995; Cejka & Eagly, 1999; Deaux & Lewis, 1983; Kagan, 1964; Myers & Gonda, 1982; Spence & Sawin, 1985). It is certainly possible—and indeed likely—that women would respond differently to threats to different aspects of their physical femininity. In the current studies, however, we opted to focus on facial femininity for both theoretical and practical reasons. To draw a clear distinction between physical and psychological femininity feedback, we wanted to focus on an aspect of appearance that is not closely tied to one's personality. More malleable and thus more controllable components of physical appearance (e.g., clothing and hairstyle) are more likely to reflect one's personality than less malleable and thus less controllable components (e.g., face and body shape). Additionally, whereas it reasonable to expect that participants would find randomly assigned feedback on their facial femininity plausible, it is less reasonable to expect that they would find randomly assigned feedback on, say, the femininity of their hairstyle or clothing plausible. After all, participants likely have a strong sense of what the general consensus would be about how feminine those aspects of

their appearance are. They may have less of a clear sense, however, of how feminine others believe their face is. Finally, extensive research has been conducted on consequences of facial femininity and masculinity and has demonstrated that complex inferences and judgments are often made on the basis of facial appearance (Zebrowitz & Montepare, 2014). Thus, facial appearance was an ideal target for feedback in these studies. Future research, however, should expand upon the current studies by examining whether our results extend to feedback on the femininity of women's *bodily* appearances.

Additionally, the current set of studies focused solely on *psychological* consequences of gender stereotypicality threats. Future work should build upon this to examine *behavioral* consequences of such threats—and, specifically, on potential compensatory assertions of femininity (Cheryan & Monin, 2005). Just as men engage in traditionally masculine behaviors following threats to their psychological masculinity (e.g., Berke et al., 2017; Bosson & Vandello, 2011; Parent et al., 2018; Talley & Bettencourt, 2008), women may engage in physical feminization (e.g., cosmetic application, use of photo editing applications, etc.) following threats to their physical femininity. Examinations of potential compensation in the wake of physical femininity threats can help to elucidate how women cope with this anxiety-inducing and self-esteem-diminishing experience.

Furthermore, although Study 2 provided initial evidence that a sense of identity invalidation may help to explain the effects of threats to gender stereotypicality on state anxiety and self-esteem, this finding must be explored further before firm conclusions can be drawn about the psychological mechanisms underlying the observed effects. The measures of felt identity invalidation used in this study were not validated scales, and the measure of results-identity discrepancy, which mediated the effect of gender stereotypicality threats on anxiety and self-esteem, consisted of a single item—"I feel like the results I received are

consistent with my beliefs about who I really am" (R). Although this item asked participants to report the extent to which the feedback they received was discrepant with their beliefs about *who* they really are (i.e., their identity or sense of self), participants may have interpreted this item as referring to their beliefs about what their appearance or personality is like (i.e., whether the results they received were accurate). Future research should therefore develop and validate a more formal measure of felt identity invalidation to more reliably establish whether the feeling that one's internal sense of self or membership in a gender group is not being recognized can account for the negative psychological effects of gender stereotypicality threats. Future studies could also directly manipulate identity invalidation in cisgender women and men (e.g., by leading women to believe they were mistaken for men and men to believe they were mistaken for women) to help determine whether identity invalidation indeed produces increased anxiety in women and men and reduced self-esteem in women.

Finally, the results of Study 2 suggested that gender stereotypicality threats can affect individuals' gender identities. In this study, participants whose gender stereotypicality was threatened reported less gender-congruent gender identities than those whose gender stereotypicality was affirmed. This effect, however, was driven by women in the personality condition. Indeed, the pattern of results for gender identity was the exact opposite of the pattern of results for anxiety. (Whereas women in the personality condition were the only group that did *not* experience effects of gender stereotypicality threats on anxiety, they were also the only group that *did* experience effects of gender stereotypicality threats on gender identity.) One possible explanation for these inverse results is that because psychological femininity threats were not anxiety-inducing for women, those who received feedback indicating that they were less feminine than average internalized this feedback and

incorporated it into their sense of self. Indeed, the discrepancy participants felt between their internal sense of self and the results they received appeared to be lower among women in the personality threat condition than participants in any of the other threat conditions. It is also possible that the reverse causal relationship was at play—that because women who received feedback indicating that they were less feminine than average incorporated that feedback into their sense of self, they did not find this feedback anxiety-inducing. Additional research is therefore needed to explain these findings and to examine other ways in which external feedback about one's gender stereotypicality might influence one's internal sense of self.

Conclusions

Although past work has demonstrated that women do not experience anxiety in response to threats to their psychological femininity, the present studies reveal that women do, indeed, experience heightened levels of anxiety—as well as reduced levels of self-esteem—in response to threats to the femininity of their physical appearance. Furthermore, the current studies demonstrate that these effects are not the result of women interpreting threats to their physical femininity as threats to their physical attractiveness. Rather, they may result from a sense of identity invalidation that threats to gender stereotypicality evoke. Finally, these studies reveal that men experience anxiety, but *not* reduced self-esteem, in response to masculinity threats across the domains of personality and physical appearance—but that this effect is particularly strong in the case of threats to physical masculinity. Overall, this research suggests that conversations about gender stereotyping and the consequences thereof should be expanded to include expectations about not only women and men's psychological characteristics but their physical characteristics, as well.

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Chapter 3: Conclusion

Gender stereotypes represent beliefs about both what women and men *are* like (descriptive stereotypes) and what women and men *should* be like (prescriptive stereotypes) (Burgess & Borgida, 1999; Heilman, 2001; Fiske & Stevens, 1993). A major portion of literature on the content and consequences of gender stereotypes has focused on what can broadly be described as psychological characteristics—primarily personality traits but also interests and cognitive abilities. Gender stereotypes, however, comprise both psychological *and physical* attributes (Cejka & Eagly, 1999; Deaux & Lewis, 1983, 1984; Kagan, 1964), and this dissertation focuses on the latter. Across four studies, I find that whereas men experience anxiety in response to threats to their masculinity across the domains of personality and physical appearance, women only experience anxiety (as well as reduced self-esteem) in response to threats to the femininity of their physical appearance. Furthermore, I find that identity invalidation—and specifically, a sense that one's internal sense of self is not externally recognized—may underlie these effects.

Although this dissertation represents an important first step toward understanding the phenomenon of femininity threat, given the dearth of previous research on this topic, much work remains to be done. In this concluding chapter, I therefore present a preliminary agenda for further research on femininity threat. I begin by briefly summarizing the findings of this dissertation. I then highlight three key contributions of these findings to the broader field of psychology—and the psychology of gender in particular. Finally, I explore additional questions about femininity threat that were not answered—or not fully answered—in this dissertation. By pursuing these questions, future research can develop a richer and more comprehensive understanding of the mechanisms, consequences, and generalizability of the negative effects of physical femininity threats on women.

Summary of Dissertation

In *Chapter 1* of my dissertation, I provided an overview of key constructs—namely, gender stereotypes, gender identity, gender stereotypicality threats, and identity invalidation—and highlighted several gaps in the literature on gender stereotypes that require further attention. First, I called for more research on the physical components of gender stereotypes (Cejka & Eagly, 1999; Deaux & Lewis, 1983, 1984; Kagan, 1964). Second, I argued that stereotypes about physical appearance are particularly central to how people think about femininity (Aube et al., 1995; Spence & Sawin, 1985) and therefore that by neglecting stereotypes within this domain, past work may have overlooked important ways in which stereotypes harm women. Third, I organized situations in which gender stereotypes shape impressions of and therefore harm women along two dimensions (perspective: external vs. internal and stereotype congruence: congruent vs. incongruent) and therefore four categories: (a) situations in which others believe a woman is stereotypical (Eagly & Karau, 2002; Heilman, 1983); (b) situations in which others believe a woman is counter-stereotypical (Eagly & Karau, 2002; Rudman & Glick, 2001); (c) situations in which a woman believes she is stereotypical (Spencer et al., 1999); and (d) situations in which a woman believes she is counter-stereotypical. I noted that extensive research has examined the first three types of situations but that the final type of situation, in which a women's femininity is threatened, has been largely neglected. I also noted that the paucity of research on femininity threats stands in stark contrast with the abundance of research on masculinity threats. I argued that although examinations of gender stereotypicality threats in men are important, so too are examinations of these threats in women. Finally, I asserted that more research is needed to determine whether gender stereotypicality threats have an effect on identity and/or the sense that one's internal identity is not externally recognized (i.e., identity

invalidation; Campbell & Troyer, 2007; Cheryan & Monin, 2005; Franco & O'Brien, 2018). As a whole, *Chapter 1* laid the foundation for the empirical work presented in *Chapter 2*.

Chapter 2 sought to address the gaps in research highlighted in *Chapter 1* by examining whether women experience anxiety and/or reduced self-esteem in response to femininity threats within the domain of physical appearance and if so, whether a sense of identity invalidation can help to explain these effects. Study 1a, but not 1b, found that women indeed experience anxiety in response to threats to, as compared to affirmations of, their physical femininity, even when their physical attractiveness has been affirmed and even when controlling for self-perceptions of physical attractiveness. Study 1c revealed that women experience not only anxiety but also reduced self-esteem in response to these threats, compared to affirmations, regardless of whether or not the characteristics that make up a "feminine" appearance are laid out for them, and even when controlling for self-perceived physical attractiveness. In Study 2, which looked at both women and men and randomly assigned participants to receive feedback on either their physical appearance or personality, I found that whether women experience anxiety and reduced self-esteem in response to threats to their femininity, relative to affirmations of their femininity, depends on what domain of femininity they receive feedback on. Only femininity threats within the domain of physical appearance produced anxiety and reduced self-esteem. By contrast, Study 2 demonstrated that whether men experience anxiety and reduced self-esteem in response to threats to their masculinity, compared to affirmations of their masculinity, does *not* depends on what domain of masculinity they receive feedback on. Masculinity threats produced anxiety across domains and had no effect on self-esteem in either domain. Furthermore, a sense that the results one received were inconsistent with one's internal sense of self (i.e., "results-identity discrepancy") statistically explained the moderated effects of femininity

feedback on anxiety and self-esteem in women and the main effect of masculinity feedback on anxiety in men. Finally, meta-analyses of the studies presented in *Chapter 2* indicated that across studies, women—including sexual minority women—experienced anxiety and reduced self-esteem in response to threats to their physical femininity, as compared to affirmations of their physical femininity. Overall, *Chapter 2* revealed robust effects of physical femininity threats on anxiety and self-esteem in women.

Contributions

This research makes several contributions to the literature on the psychology of gender. First, it challenges the prevailing wisdom that women are not distressed by threats to their femininity. Second, it uncovers a likely mechanism underlying the effects of gender stereotypicality threats on anxiety. Additionally, it challenges the idea that femininity and attractiveness in women are one and the same. Finally, it highlights the consequences of gender stereotypicality threats within a novel context. In this section, I elaborate on each of these contributions.

Past work has suggested that men are more constrained by injunctive gender stereotypes than women are (Sirin et al., 2004) and that as a result, men, but not women, experience psychological distress in response to gender stereotypicality threats (Vandello et al., 2008). This dissertation challenges this conclusion by expanding the scope of research on gender stereotypicality threats to include stereotypes within the domain of physical appearance and demonstrating that women indeed experience anxiety and reduced self-esteem in response to threats to their physical femininity. Buoyed by Vandello and colleagues' (2008) finding that men but not women experience anxiety in response to threats to their gender stereotypicality, research on masculinity threats has taken off in recent years. By providing clear evidence, across four studies, that women indeed experience anxiety in

response to threats their physical femininity, the work presented in this dissertation serves as a call for more research on this phenomenon.

Relatedly, this work also complicates the prevailing wisdom that manhood is more "precarious" than womanhood is. The theory of precarious manhood asserts that whereas womanhood is understood to be a biological status that is inevitably reached with age, manhood is understood to be a social status that requires constant work to achieve and maintain—and that can be lost at any time (Vandello & Bosson, 2013). This theory has been supported by two main types of evidence: (i) evidence that when people think about manhood and womanhood in general, they tend to think of the former as more social and as requiring more work than the latter; and (ii) evidence that, as described previously, men, but not women, experience distress in response to gender stereotypicality threats (Vandello et al., 2008). One explanation for the first finding might be that apparent effortlessness is a key component of idealized femininity; women are expected to engage in femininity work without anyone being aware of it (Clarke & Griffin, 2007; Kwan & Trautner, 2009; Toerien & Wilkinson, 2003). However, the current research does not directly speak to this piece of evidence for the theory of precarious manhood. It *does*, however, directly challenge the second piece of evidence. Because the final study presented in this dissertation found that men experienced anxiety in response to threats to the masculinity of both their physical appearance and their personality, some might argue that it provides additional support for the idea that men are more readily threatened by gender stereotypicality threats than women are—and therefore that manhood is indeed particularly precarious. I would assert, however, that the number of domains in which people negatively respond to gender stereotypicality threats is not the only reasonable operationalization of precariousness. Indeed, it could just as easily be argued that because women, but not men, experienced reductions in explicit self-

esteem in response to gender stereotypicality threats, relative to affirmations, womanhood is more precarious than manhood is. I would disagree with this assertion, as well. The current research cannot directly speak to the question of whether manhood is more precarious than womanhood is. Indeed, this question might not even be an appropriate one, given that female adults are often labeled as "girls," rather than "women" (MacArthur et al., 2020) and frequently do not even identify as "women" themselves (Chrisler, 2013). This research does, however, suggest that just as men are psychologically invested in their masculinity, so, too, are women psychologically invested in their femininity. And believing they have failed to achieve an adequate level of femininity is psychologically distressing. Thus, this research begins to point to the precariousness of femininity.

The work presented in this dissertation also provides evidence for a mechanism underlying the effects of gender stereotypicality threats in both women and men. Specifically, it indicates that a feeling of misalignment between external and internal impressions of oneself (what we call "results-identity discrepancy" and conceptualize as a component of felt identity invalidation) can help to explain these effects. In the final study of this dissertation, we found that this results-identity discrepancy mediated the moderated effects of femininity threats on anxiety and self-esteem in women and the main effects of masculinity threats on anxiety in men. We also found that the only instance in which gender stereotypicality feedback had *no* effect on anxiety (women who received feedback on their personality) was also the only instance in which gender stereotypicality feedback *had* an effect on gender identity, suggesting that gender stereotypicality threats might only be distressing to the extent that they contradict one's deeply held, internal sense of self. Whereas much past work has focused on documenting the consequences of gender stereotypicality threats (for men in particular), the current work provides insight into why these threats are hurtful.

This dissertation also highlights the importance of distinguishing between physical femininity and physical attractiveness, two constructs that are often conflated in research on women's body-related cognition and affect. In the studies presented in this dissertation, self-perceived physical femininity and self-perceived physical attractiveness were indeed moderately to highly correlated. They were not, however, so highly correlated as to be redundant with one another, and in none of these studies did physical attractiveness feedback affect self-perceived physical femininity or did physical femininity feedback affect self-perceived physical attractiveness. Despite not having any effect on self-perceived physical attractiveness, however, physical femininity threats consistently produced anxiety and reduced self-esteem. Thus, this dissertation suggests that fear of looking *masculine*, much like fear of looking unattractive, constitutes a key component of feminine gender role stress—or the stress associated with being a woman (Gillespie & Eisler, 1992). Past work has highlighted the importance of achieving a feminine physical appearance among transgender women (that is, women who were assigned to the male sex at birth; Ainsworth & Spiegel, 2010; White Hughto & Reisner, 2016; Plemons, 2017). This dissertation extends this work and demonstrates that physical femininity—and facial femininity in particular—is important to cisgender women, as well. By drawing attention to the distinction between femininity and attractiveness, this dissertation broadens the scope of research on body image—and particularly appearance (dis)satisfaction—in cisgender women.

Finally, this dissertation illustrates potential harms of software designed to assess people's faces and speech. Scientists are increasingly using deep learning to build artificial neural networks (i.e., networks of algorithms) that can analyze people's appearances and behaviors. Researchers have developed networks to classify faces by gender (Jia & Cristianini, 2015; Shan, 2012) and sexual orientation (Wang & Kosinski, 2018), as well as to

evaluate people's attractiveness (Eisenthal et al., 2006; Liu et al., 2019) and personality (Suen et al., 2020; Wei et al., 2018). As this technology has become more widespread, so too has its use by private businesses. Smartphone applications like FaceRate use deep learning to rate users' attractiveness, and platforms like HireVue use machine learning to evaluate job applicants' personalities (Leutner et al., 2020). As this technology becomes increasingly "social," it is critical for social scientists to examine not only its benefits but also its unintended consequences.

In past work on gender stereotypicality threats, participants received feedback that was supposedly based on their responses to a knowledge test (Lee-Won et al., 2017), personality test (Willer et al., 2013), or interest or consumer preferences inventory (Cheryan et al., 2015; Frederick et al., 2017). In the current studies, participants received feedback that was supposedly based on novel software's analysis of a photograph or video they had uploaded. Although no photographs or videos were actually analyzed in these studies, the description of the software that was supposedly used was based on descriptions of real deep learning software and therefore allowed us to examine how participants would respond to judgments that were allegedly derived from algorithms. The results of this dissertation illuminate how psychologically harmful judgments of femininity and masculinity can be, even in the absence of other humans. Thus, the current research indicates that before creating software to provide people with feedback on their femininity or masculinity, researchers and developers would be advised to consider the likely deleterious consequences of such work.

Limitations and Open Questions

More research is needed to develop a comprehensive understanding of the phenomenon at the center of this dissertation: femininity threats. The first three studies in this dissertation focused on documenting and exploring some of the boundary conditions of

this phenomenon. These studies determined that physical femininity threats, relative to physical femininity affirmations, produce anxiety and reduced self-esteem in women and established that these effects can occur even when these threats are not interpreted as threats to attractiveness and even when physical femininity is not defined for women. The final study took a broader perspective on femininity threats and confirmed what we expected: that psychological femininity threats do *not* produce anxiety or reduced self-esteem in women.

Although research on masculinity threats is plentiful, research on femininity threats is not. Much additional work is therefore needed to produce a comprehensive body of literature on this topic—particularly, on *when* and *which* women experience (or do not experience) psychological distress in response to these threats, as well as on the effects of these threats not only for those who have been threatened but for people in general. In this section, I begin by considering the methods used in the current studies and provide suggestions for how future work might expand upon them. I then lay out three urgent directions for future work on femininity threats.

Methodological Considerations

To my knowledge, this dissertation represents the first empirical examination of women's psychological responses to physical femininity threats. In designing these studies, my collaborators and I made a number of methodological decisions, each of which had both benefits and drawbacks. In this section, I explore three of these decisions and provide suggestions for how future research employing similar paradigms might capitalize upon the strengths and address the limitations of the methods used here.

In these studies, we were primarily interested in between-group differences—specifically, differences between women whose femininity was threatened and women whose femininity was affirmed. Thus, we randomly assigned participants to one of the feedback conditions and compared levels of anxiety and self-esteem after participants had received feedback on their appearance. These between-subjects designs enabled us to make the desired comparisons between participants whose femininity was threatened and participants whose femininity was affirmed. They did, not, however, allow us to draw definitive conclusions about which condition(s) drove the observed effects. Although we framed these studies largely in terms of the effects of femininity threats on anxiety and self-esteem, the between-group differences that emerged might have also or alternatively resulted from the effects of femininity *affirmations* on anxiety and self-esteem.

To gain insight into which condition(s) drove the observed effects, we included control conditions in the first two studies. In Study 1a, in which we observed the predicted effect of physical femininity feedback on anxiety, levels of anxiety among participants in the control condition fell squarely between those of participants in the threat condition and participants in the affirmation condition, thus suggesting that both feedback conditions contributed to the observed effects. We also observed, through moderation analyses, that

gender identity centrality predicted levels of anxiety and self-esteem following physical femininity threats, but not physical femininity affirmations, suggesting that the effects of feedback on these outcome variables were driven primarily by participants whose femininity was threatened. Still, one way to determine which condition(s) produce changes in anxiety and/or self-esteem would be to add a within-subjects component to these studies—for instance, to measure anxiety and self-esteem both before and after participants receive feedback. Therefore, future work examining the psychological consequences of femininity—or masculinity—feedback would be advised to employ a pretest–posttest design.

Additionally, to gain a clearer sense of whether women's baseline levels of anxiety and self-esteem are closer to those reported after experiencing femininity threats or those reported after experiencing femininity affirmations, future research might make use of alternative control conditions. The control condition used in the first two studies in this dissertation provided participants with an error message indicating that their photograph could not be analyzed. Although this control was appropriate in that it ensured that participants went through the exact same procedure as those in the experimental conditions, it might not have been ideal given that receiving an error message about one's physical appearance could itself be an anxiety-inducing experience for some people (Hirsh & Inzlicht, 2008). Additionally, because we dropped the control condition in later studies, we were unable to determine whether levels of anxiety among participants in this condition reliably fell between those of participants in the two experimental conditions. Future research might therefore make consistent use of a more neutral control than that used in the studies presented here. For example, it might inform participants that they are *going* to receive feedback about their femininity—but assess their anxiety and self-esteem *before* providing them with that feedback.

Finally, the current studies provided participants with feedback that was supposedly based on a deep learning analysis of a photograph or video they had uploaded and informed participants that the software being used to analyze their appearance (or personality, in Study 2) was trained on thousands of photographs (or videos, in Study 2) that had been rated by panels of human coders. By grounding gender stereotypicality feedback in human ratings, we aimed to convey to participants that they were indirectly being judged by other people. Indeed, past research demonstrates that artificial intelligence can be used to create environments that feel distinctly social (Nash et al., 2018). Furthermore, by providing feedback that was supposedly derived from an algorithm, rather than a single person, we aimed to convey to participants that the feedback they received was based on a shared, rather than an esoteric, understanding of femininity.

It is possible that participants would have responded differently to the feedback they received had it come from, for example, a human interaction partner. On the one hand, such feedback might be easier to dismiss, as a single person's impression is inherently subjective and likely not representative of most people's impressions of one's appearance or personality. On the other hand, feedback from software might be easier to dismiss, as this sort of technology is inevitably imperfect and often systematically biased (Danks & London, 2017). Future work might therefore manipulate the source of the feedback participants receive, such that they are randomly assigned to receive feedback from either from an algorithm that analyzes femininity on the basis of general consensus or from another person.

Future work exploring the effects of femininity feedback from other people, rather than algorithms, should also consider the social identities of the people providing this feedback. As discussed in more depth in the following section, women's attributions for femininity feedback might influence their psychological responses to it—and the identities of

the person or people providing this feedback might influence their attributions. For example, if a woman's physical femininity is threatened by a man or group of men, she might be more inclined to dismiss that threat as the product of harmful gender stereotypes than if her physical femininity is threatened by another woman or group of women. On the other hand, given that femininity is often defined by its appeal to the "male gaze" (Berger, 1972; Hoskin, 2019; Mulvey, 1999), a woman might be less inclined to dismiss a physical femininity threat coming from a man or group of men than a threat coming from a woman or group of women. These two competing possibilities—as well as other ways in which the source of femininity feedback might influence women's psychological wellbeing—ought to be considered in future work.

In sum, the methods used in the current research allowed us establish that physical femininity feedback supposedly derived from an algorithmic evaluation of one's facial appearance has a reliable effect on anxiety and self-esteem in women. More research is needed, however, to conclusively determine which type of physical femininity feedback—threat or affirmation—drives these effects and to elucidate whether and how these effects would vary with varying sources of feedback.

Directions for Future Research on Femininity Threats

In the previous section, I explored methodological limitations of the current research that could be addressed with relatively minor changes in future research. In this section, I lay out three urgent directions for future work on femininity threats, which can, respectively, deepen, extend, and expand the studies presented here: (i) research on why women do not appear to be distressed by psychological femininity threats; (ii) research on the direct and proximal, as well as indirect and more distal, consequences of physical femininity threats; and (iii) research on the extent to which women of color—particularly Black women—and

sexual minority women are distressed by physical femininity threats. Together, this work can help to not only shed further light on the research presented in this dissertation but also elucidate both its generalizability and reach. These suggested future lines of research are illustrated in Figure 3.1 and explored in more depth below.

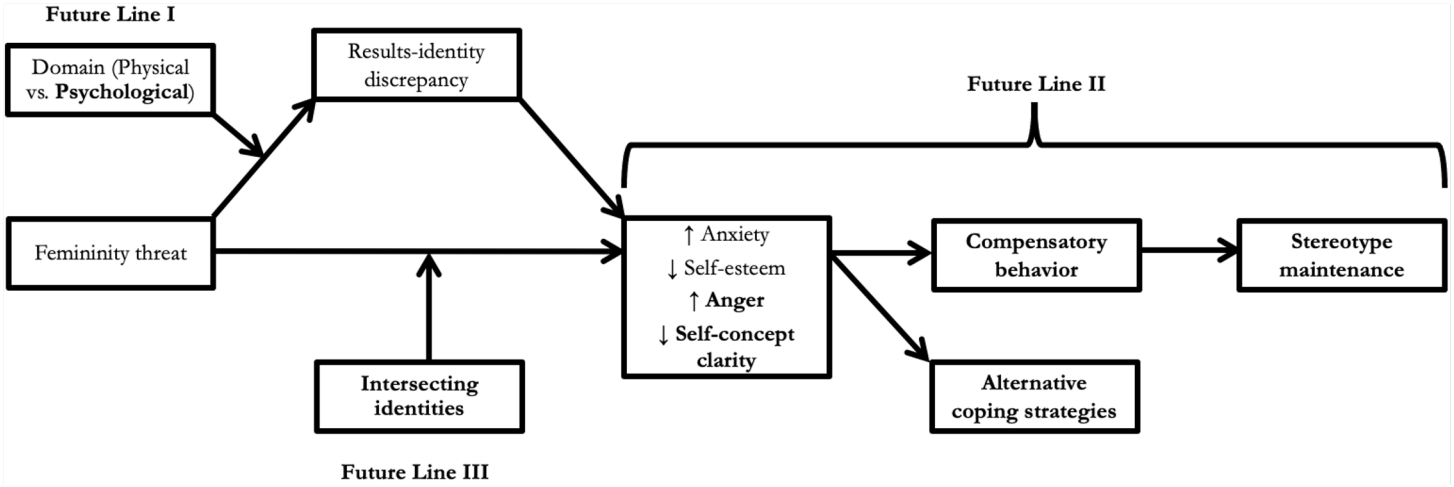

Figure 3.1. Overview of current and suggested research on femininity threat. Research covered in this dissertation is presented in plain text. Potential directions for future research are presented in bold text.

Future Line I: Why Are Women Affected by Physical *but Not* Psychological *Femininity Threats?*

The studies in this dissertation revealed that women experience anxiety and reduced self-esteem in response to threats to the femininity of their physical appearances but not threats to the femininity of their personalities. Furthermore, these studies revealed that threats to the femininity of women's physical appearances produce a greater sense of identity invalidation than threats to the femininity of their personalities do—and that this sense of identity invalidation mediates the interactive effect of femininity feedback (threat vs. affirmation) and domain (physical appearance vs. personality) on anxiety and self-esteem. Although this moderated mediation begins to suggest that identity invalidation can help to explain why threats to physical but not psychological femininity are distressing to women, it does not fully account for these disparate effects. After all, women *did* report higher levels of identity invalidation when the femininity of their personality was threatened than when it was affirmed, but this sense of invalidation did not result in anxiety or reductions in self-esteem. The question therefore remains: If women experience distress in response to threats to their physical femininity, then why do they *not* experience distress in response to threats to their psychological femininity?

Information suggesting that a woman's personality is counter-stereotypical has two critical implications: (a) that she possesses traits that are incongruent with beliefs about what women are like; (b) that she possesses traits that are highly valued and considered high status (Feinman, 1981; Rudman & Glick, 1999; Cejka & Eagly, 1999) and does *not* possess traits that are devalued and considered low status (Hoskin, 2019). It is therefore possible that this information is simultaneously threatening—of women's gender stereotypicality—and affirming—of women's status. If this is the case, we would expect one of two possibilities:

(a) this information would produce increased anxiety in women who place high value their femininity, relative to their status, and reduced anxiety in women who place low value on their femininity, relative to their status; (b) these two interpretations would produce contradictory effects in women, essentially canceling each other out.

Testing the first possibility would require measuring additional moderators, providing women with feedback on the femininity of their personality (threat vs. affirmation—or perhaps more accurately, counter-stereotypical vs. stereotypical feedback), and examining whether the measured moderators predict levels of anxiety among women who are told their personality is counter-stereotypical as compared to women who are told their personality is stereotypical. Specifically, it would require measuring the extent to which women value their femininity, relative to their status, and/or their endorsement of traditional gender roles (Levant et al., 2007). In the final study of this dissertation, we measured gender identity, and this measure included the items "On the inside, I feel feminine" and "On the inside, I feel masculine." These items were completed *after* the manipulation, however, and the manipulation had an effect on gender identity. Additionally, this measure did not assess the extent to which women *valued* their femininity—only the extent to which they *felt* feminine. Therefore, in a follow-up study, prioritization of femininity, versus status, would need to be measured before the manipulation, as would endorsement of traditional gender roles, which measures the extent to which people believe that in general, women and men should behave differently and occupy different social roles. I would predict that the more women value their femininity over their status and the more they endorse traditional gender roles, the more anxiety (and potentially reduced self-esteem) they would experience in response to feedback indicating that their personality is counter-stereotypical (i.e., masculine, rather than feminine). By examining potential moderators of the effects of psychological

femininity threats, future research can determine whether it is indeed that case that women do not experience anxiety or reduced self-esteem in response to such threats or rather, whether some women experience anxiety and reduced self-esteem in responses to these threats, whereas others do not.

Testing the second possibility—that the implications of counter-stereotypical feedback for femininity and status produce contradictory effects, thus canceling each other out—would require manipulating the framing of this feedback. For example, the manipulation could frame feminine personality traits as high-status and highly valued in society (for example, by indicating that research has found that people who possess these traits are more successful and increasingly sought out in business and politics) or as low-status and not particularly valued in society (for example, by indicating that research has found that people who possess these traits are less successful and not sought out in business and politics)—or present no information about the status of these traits.

Additionally, because, in the final study of this dissertation, the effect of masculinity threats within the domain of personality on men's anxiety was only marginally significant, it is important to consider the possibility that participants in this study found the feedback about their appearances more meaningful than the feedback about their personalities. For example, participants might have been acting differently in the videos they submitted than they do in their day-to-day lives and therefore more inclined to dismiss the feedback about their personality than the feedback about their appearance. Therefore, future research could use a slightly different paradigm to provide this feedback. Although it was important in the current work to have participants upload videos of themselves so that we could credibly provide them with feedback about *either* their physical appearance *or* their personality, this would not be necessary in research focused solely on personality feedback. Therefore, in

future research, rather than uploading videos of themselves speaking, participants could simply complete personality and/or interest inventories, as they have done in past research (Frederick et al., 2017; Willer et al., 2013). By strategically manipulating the framing of psychological femininity threats, future research can help to explain why women—or at least many women—do not experience these threats as distressing.

Future work could also consider why men *are* distressed by feedback indicating that they are less psychologically masculine then average—and, specifically, whether the anxiety men experience in response to such feedback results from the threat to their *identity* or the threat to their *status* that this feedback represents. Given that status is such a fundamental element of the male gender role (Moss-Racusin et al., 2010), parsing the distinct contributions of identity threat and status threat to men's responses to masculinity threats would be a difficult endeavor. By framing masculine personality traits as either high-status or low-status, the two could theoretically be disentangled. For example, similar to that which was proposed for future studies on femininity threat, participants could be told that people who possess masculine traits are generally successful and sought out in business and politics *or* that people who possess these traits are often *unsuccessful* and decreasingly sought out in business and politics. Such a manipulation might not be feasible, however, as informing men that masculine personality traits are decreasing in status might itself present a *group status threat* to men—and this sort of threat is liable to produce the same sorts of effects that a threat to a man's individual masculinity would (Willer et al., 2013).

More broadly, given how intimately connected gender and status are, the current work, in conjunction with past work on masculinity threats, raises questions as to how unique the observed results are to gender—and how likely they would be to generalize to other social categories. Social dominance theory (Pratto et al, 2006; Sidanius & Pratto, 2001)

posits the existence of three major types of group-based hierarchies: one based on age (in which adults hold power over children), one based on gender (in which men have higher status and hold more power than women), and one based on "arbitrary sets" (such as religion or race, in which certain groups have higher status and hold more power than others). Although these three types of hierarchies are unique from one another in several ways, they also possess similarities. For example, just as threats to the privileged status of men have been linked to assertions of male superiority and dominance (Willer et al., 2013), threats to the privileged status of White Americans have been linked to increased prejudice against racial outgroups and increased support for policies that preserve the status quo (Craig et al., 2018). The asymmetry in women's and men's responses to psychological gender stereotypicality threats may therefore reflect a broader tendency for high status groups to be more vulnerable to stereotypicality threats than low status groups are. More research is needed, however, to test this possibility.

Future Line II: Consequences of Physical Femininity Threats

In this dissertation, I demonstrated that women experience anxiety and reduced self-esteem in response to threats to the femininity of their physical appearances. Furthermore, I found that a sense of identity invalidation statistically explained this effect. It is possible, however, that the psychological consequences of physical femininity threats extend beyond these specific constructs. Furthermore, the question remains: How do women *cope* with the feelings of identity invalidation and psychological distress that physical femininity threats produce? And what are the consequences of these coping strategies? Here, I lay out three avenues for future research that can begin to answer these questions. The first avenue focuses on expanding the focus of research on psychological responses to physical femininity feedback by considering not only anxiety and self-esteem but also other emotions

and elements of the self-concept. The second avenue focuses on moving beyond women's *psychological* responses to physical femininity threats to explore their *behavioral* responses to these threats. Finally, the third avenue focuses on examining potential consequences of these behavioral responses.

How *Else* Do Women Psychologically Respond to Physical Femininity Threats?. In the current set of studies, we were primarily interested in the effects of physical femininity threats on anxiety, which past work has demonstrated masculinity threats produce in men (Vandello et al., 2008). Future work, however, would benefit from also considering the effects of femininity threats on other forms of emotional distress—and on anger in particular (Spielberger et al., 1983). Although anxiety and anger are similar in terms of both valence (negative) and arousal (high), they differ from one another in several important ways. Whereas anxiety has been described as involving a feeling of submissiveness, anger has been described as involving a feeling of dominance (Russell & Mehrabian, 1974). Whereas anxiety has been described as being avoidance-oriented, anger has been described as being approach-oriented (Mauss & Robinson, 2009). And whereas anxiety has been described as a response to hazards, anger has been described as a response to moral transgressions (Petersen, 2010). Furthermore, when it comes to interpersonal rejection (a phenomenon that is distinct from but likely related to gender stereotypicality threats), anxiety, more so than anger, tends to follow from self-blame (internal attributions), whereas anger, more so than anxiety, tends to follow from other-blame (external attributions) (Zimmer-Gembeck et al., 2016).

Causal attributions for femininity threats—which likely vary as a function of both the situation and the individual—may therefore influence the extent to which women respond to these threats with anxiety versus anger. To the extent that women make internal attributions

for these threats (i.e., attribute them to a true lack of femininity), they may respond with anxiety. To the extent that they make *external* attributions (e.g., attribute threats to raters' narrow, misguided understandings of what is means to look "feminine"), however, they may respond with anger. Future research is therefore needed to determine *whether* and if so *when* and *in whom* physical femininity threats produce anger, as opposed or in addition to anxiety. This research could begin by assessing participants' attributions for femininity threats and examining whether these attributions predict emotional responses (with more internal attributions producing more anxiety and more external attributions producing more anger). It could also experimentally manipulate the source of feedback and, as a result, attributions for feedback. For example, participants could be randomly assigned to learn that the software evaluating their appearance was developed based on the ratings of either a diverse group of women and men or a homogenous group. I would anticipate that participants in the former condition would be more likely than those in the latter to make internal attributions for the feedback and to experience anxiety and that participants in the latter condition would be more likely than those in the former to make external attributions and to experience anger.

Additionally, given that anxiety tends to involve avoidance motivation whereas anger tends to involve approach motivation (Carver & Harmon-Jones, 2009), future work might consider differences in the behavioral consequences of anxiety and anger in the wake of femininity threats. To the extent that they are motivated to act, women who make internal attributions for femininity threats—and who are therefore likely to experience anxiety—may attempt to cope by increasing the femininity of their physical appearance, as described in the following section. On the other hand, women who make *external* attributions for femininity threats—and who are therefore likely to experience anger—may attempt to cope by targeting

the source of the feedback. For example, if a woman attributes such a threat to narrow, misguided understandings of what is means to look "feminine" and becomes angry as a result, she might be inclined to take action—either individually or collectively—to address what she views as harmful gender stereotypes. Future research could test this possibility using both correlational and experimental methods. First, it could examine whether different emotional responses to femininity threats predict divergent behavioral responses. Next, if causal attributions for threats indeed inform emotional responses (as predicted above), it could experimentally manipulate these attributions and examine not only state anxiety and anger but also behavioral intentions and actions.

Future work also ought to examine the effects of physical femininity threats on elements of the self-concept other than self-esteem (Campbell et al., 1996). In the current studies, we opted to focus on self-esteem, an evaluative component of self-concept, as experiences with identity denial have been linked to reductions in self-esteem, or negative evaluations of the self. Future research, however, would benefit from taking a broader perspective on self-concept and considering the extent to which these threats affect self-concept clarity, defined as "the extent to which the contents of an individual's self-concept…are clearly and confidently defined, internally consistent, and temporally stable" (Campbell et al., 1996). Experiences with rejection or failure in valued domains have been linked to reductions in self-concept clarity (Ayduk et al., 2009; Lavallee & Campbell, 1995; Nezlek & Plesko, 2001), as have the imagined loss of a valued social identity (Slotter et al., 2015) and the disconfirmation of self-beliefs (Hertel, 2017). Thus, threats to physical femininity are likely to have a destabilizing effect on self-concept, particularly among women who think of themselves as feminine and/or see their femininity as central to their overall sense of self. In other words, physical femininity threats might lead women to question or

doubt who they are as people. Measuring self-concept clarity in future studies would contribute to a more thorough understanding of the effects of physical femininity threats on women's sense of self.

How Do Women Behaviorally Respond to Physical Femininity Threats?. Experiences with actual or anticipated invalidation have been linked to the pursuit of external identity affirmation (e.g., Sevelius, 2013). For example, transgender women who have few opportunities for such affirmation have reported that sex with men can validate their gender identity (Melendez & Pinto, 2007; Nemoto et al., 2004) and that they may engage in sexual activity that they otherwise would not if it affirms their sense of womanhood (Bockting et al., 1998; Edwards et al., 2007). Experimental work has also demonstrated that experiences with identity invalidation can lead to compensatory assertions of identity. When Asian Americans experience challenges to their American identity, for example, they have been shown to put extra effort into demonstrating their knowledge of American culture (Cheryan & Monin, 2005). Research on masculinity threat has revealed similar results. When men's masculinity is threatened, they tend to assert it through traditionally masculine behaviors and attitudes, including violence and aggression, support for war, homophobia, and interest in buying a sports utility vehicle (Bosson & Vandello, 2011; Bosson et al., 2009; Glick et al., 2007; Talley & Bettencourt, 2008; Willer et al., 2013). Although the ways in which transgender women feminize their physical appearances in the pursuit of identity recognition has been preliminarily considered (e.g., Plemons, 2017), to my knowledge, research has yet to consider femininity work as a strategy by which cisgender women seek to obtain identity affirmation in the wake of threats to their physical femininity.

Future work might consider examining whether cisgender women engage in compensatory behavior in response to threats to their physical femininity. Additionally,

given that past work has suggested that such "recovery strategies" may not, in fact, restore self-esteem (Rudman & Fairchild, 2004), future research should investigate whether these assertions of femininity are psychologically effective as coping mechanisms.

I began testing the first question—whether women "compensate" in response to physical femininity threats—in a pilot study that was interrupted by the COVID-19 pandemic and which can serve as a model for future research. In this study, we gave participants feedback on their physical femininity and then instructed them to create a social media profile by taking a photograph of themselves (i.e., a "selfie"), editing and applying filters to the photograph as desired, and reporting on their personality traits and interests. Participants were not given specific instructions for taking the photographs, as we wanted them be free to make their own decisions about their facial expression, bodily posture, and positioning, all of which can serve specific impression management goals (e.g., appearing more feminine; Krämer & Winter, 2008; Smith & Sanderson, 2015).

In future studies, to determine whether women indeed present themselves as more feminine after their physical femininity has been threatened, participants' photographs can be coded on a number of different dimensions, such as: self-touching (i.e., touching one's face, hair, or clothing, which is more common in women's selfies than men's; Döring et al., 2016); head and body cant (which are also more common in women's selfies than men's; Döring et al., 2016); smiling (which tends to be more expansive in women's Facebook profile pictures than men's; Tifferet & Vilnai-Yavetz, 2014); use of filters (which tends to be more frequent among women than men; Dhir et al., 2016); and angle (i.e., taken from above, which is more common in women's selfies than men's; taken from below, which is more common in men's selfies than women's; or taken from the front; Sedgewick et al., 2017). Personality traits and interests would not need to be manually coded if, as in our pilot study,

they are taken from previous studies of gender stereotypes (Deaux & Lewis, 1984; Haines et al., 2016; Prentice & Carranza, 2002; Spence et al., 1974, 1975; Zinkhan et al., 2004). Analyses of these data could reveal not only *if* women compensate for threats to their physical femininity but also *how* women compensate—that is, whether they assert their femininity in the domain in which they were threatened (physical appearance) or in another domain (personality or interests).

To answer the question of whether such compensation serves as an effective coping strategy, future studies could also measure anxiety, self-esteem, and identity invalidation again, after participants have had the opportunity to assert their femininity, to determine whether such assertions reduce anxiety and restore self-esteem and if so, whether reductions in participants' sense of identity invalidation can explain these effects.

Future work should also examine alternative coping strategies that women may use to reduce anxiety and restore their self-esteem in the wake of threats to their physical femininity—particularly mechanisms that do not require women to devote time, energy, or money to increasing their adherence to gender stereotypes. When people experience threats to their self-integrity (i.e., their positive sense of self), they can restore it by engaging in self-affirmation (Sherman & Cohen, 2006). Importantly, such self-affirmation does not need to pertain to the same domain in which their sense of self was threatened to be effective (Sherman & Cohen, 2002; Steele, 1988). Therefore, self-affirmation exercises, in which individuals reflect on their personal values and/or skills and why these values and skills are important to them, can serve as a psychological buffer in threatening situations—particularly among people who are low in trait self-esteem (Cohen et al., 2006; Creswell et al., 2005).

In the studies in this dissertation, all participants completed such a self-affirmation exercise (Cohen et al., 2006); however, they completed it *after* they were thoroughly debriefed

on the deception involved in the study (i.e., informed that the feedback was bogus). Furthermore, anxiety and self-esteem were not measured again after participants completed the self-affirmation exercise. Therefore, future research is needed to determine whether engaging in a self-affirmation exercise can reduce women's anxiety and restore their self-esteem following experiences with physical femininity threats.

Do Behavioral Responses to Femininity Threats Maintain Physical Gender Stereotypes?. The studies presented in this dissertation focused on the experiences of women whose physical femininity had been threatened. The pressure on women to appear physically feminine, however, may have broader implications—including implications for the maintenance of descriptive gender stereotypes. As discussed, when their physical femininity has been threatened, women may put effort into "recovering" that femininity (Rudman & Fairchild, 2004) by, for example, presenting themselves in a stereotypical fashion. Similarly, women whose physical femininity has *not* been threatened may put effort into ensuring that they appear adequately stereotypical so as to avoid experiencing femininity threats. The more women feminize their appearances—to either recover from or avoid femininity threats—the less visible their "natural" appearances (i.e., their appearances in the absence of photograph editing, facial and body hair removal, cosmetic application, hair styling, etc.) become.

Humans are generally considered a sexually dimorphic species (cf. Blackless et al., 2000), and in the absence of any femininity work, women and men, on average, would no doubt look different from one another. The femininity work that women engage in, however, certainly exaggerates these differences. When women apply cosmetics, they generally darken their eyes and lips, thus increasing average gender differences in facial contrast (Etcoff et al., 2011; Russell, 2010). And when they shave, wax, or undergo electrolysis or laser hair removal (which nearly all women do; Lesnik-Oberstein, 2006;

Tiggemann & Hodgson, 2008; Toerien et al., 2005), they increase average gender differences in amount of facial and body hair. As Friedman (2013) puts it: "Polarizing grooming practices create sex differences where there are none 'naturally' or significantly exaggerate subtle differences, thus reducing the proportion of human commonalities male and female bodies would otherwise share…" (p. 82). Being unaware of these practices—or the extent to which women tend to engage in them—may lead people to believe that women and men look more different than they naturally do. As Chrisler (2013) has noted:

> Most men have no idea until they live with a woman (and maybe not even then because most of this work is done in private) how much time and effort it takes women to tame their natural bodies and shape them into an 'acceptable' look…

To test this possibility, future research could adapt a paradigm developed by Rudman and Fairchild (2004), who found that after their psychological gender stereotypicality had been threatened, men and, to a lesser extent, women expressed concerns about others' reactions to their counter-stereotypicality, engaged in attempts to conceal their counter-stereotypicality, and understood that through that concealment, they were contributing to the maintenance of gender stereotypes. To determine whether similar processes occur within the domain of physical appearance, future research could have women upload photographs of themselves (as they did in the studies in this dissertation), provide them with feedback about their physical femininity, give them the opportunity to upload *either* their original photograph *or* a new or edited photograph to a social media website, and then ask them how feminine future visitors to the social media website would expect women, in general, to look. I would predict that women who uploaded new or edited photographs of themselves, as compared to those who did not, would think future visitors to the website would expect women to look more feminine.

Future studies could also investigate the extent to which lack of awareness of femininity work reinforces descriptive gender stereotypes about physical appearance. For example, correlational research could examine whether the amount of time people believe the average woman devotes to femininity work predicts the extent to which they believe women and men naturally look different. I would predict that the less femininity work people believe women engage in, the more different they would believe women and men naturally look.

The results of such future work could inform interventions to buffer against the deleterious consequences of physical femininity threats, as well as the broader pressure to appear feminine. Given that women are inundated with images of other women whose appearances have been altered (via makeup, hair styling, and photograph editing; Wolf, 1990), they may falsely believe that most women naturally look more feminine than they actually do. This belief could produce unrealistic expectations about their own appearances—and lead them to chronically feel like they do not "measure up." Informing women about the amount of work that goes into feminizing other women's appearances might therefore alter their expectations for their *own* appearances and make them less vulnerable to physical femininity threats.

Such interventions could make use of existing media, such as Dove's *Evolution* video (Nelson, 2013; Piper, 2006), which depicts a model undergoing a dramatic physical transformation before appearing on a billboard advertisement and which concludes with the message "No wonder our perception of reality is distorted." Although this video was developed as part of Dove's "Campaign for Real Beauty" and focuses on attractiveness, rather than femininity, given how closely connected these two constructs are (Penton-Voak et al., 2004; Rhodes et al., 2000), videos like this one would also likely be effective at

correcting misconceptions about typical levels of physical femininity. By correcting these misconceptions, interventions could begin to not only alter descriptive gender stereotypes but also mitigate the negative consequences of gender stereotypicality threats.

Future Line III: Intersectional Perspectives

Gender, race, and sexual orientation all intersect with one another to form unique identities and experiences, and none of these dimensions can be fully understood in isolation from the others (Cole, 2009; Crenshaw, 1994; Essed, 1991, p. 5; Ghavami & Peplau, 2013; Rosette et al., 2018; Shields, 2008). In the research presented in this dissertation, however, which relied upon online convenience samples, the majority of women who participated were White (69%-81% across studies) and heterosexual (68%-86% across studies). In this section, I therefore propose two directions for future research that center the experiences of women who were not adequately represented in the current work and whose relationships with femininity and femininity threats may vary substantially from those of White, heterosexual women. The first proposed direction focuses on how Black and sexual minority women respond to physical femininity threats. The second considers Black and sexual minority women's relationships with femininity more broadly. The conclusions that can be drawn from the studies presented in this dissertation are limited by these studies' samples. By taking an intersectional perspective, future research can gain a more complete understanding of women's relationships with femininity and femininity threats.

Do Femininity Threats Differentially Affect Women with Different Intersecting Identities?. Additional research is needed to establish if and how women of other demographic groups respond to and cope with physical femininity threats—or, in other words, to determine how generalizable the results of this dissertation are. Here, I focus

on two groups of women—Black women and sexual minority women—who may be particularly likely to experience femininity threats in their daily lives.

Black Women. Future work might examine how Black women respond to physical femininity threats, which they may experience more often than women of other racial groups do, as well as how their *attributions* for these threats influence their psychological and behavioral responses. In past work with predominantly White samples, participants perceived Black women's faces as more masculine than White women's faces (Goff et al., 2008; Lei et al., 2020). Participant comments from the studies presented in this dissertation reveal that at least some of the Black women who participated were acutely aware of these biased perceptions and were concerned about their implications for how the software had evaluated their femininity. (Participants provided these comments *before* being debriefed.) For example, a 23-year-old Black heterosexual participant from Study 1b whose physical femininity and attractiveness had both been affirmed commented: "I mean, I was very happy that I was rated as attractive and feminine. Especially being black, I thought I would have bad results but I was shocked to see my rating was pretty good." On the flip side, a 20-year-old Black heterosexual participant from Study 1c whose femininity had been *threatened* asked:

> I was wondering who the model of femininity and masculinity is for your study and who (as in the culture and race) made this program. I know that people of certain culture view others as a more or less masculine than a person of another culture. For example, white people will find black characteristics on women more masculine, and it is difficult for people to recognize the ages of people from differing cultures. So who are we being judged by?

Additionally, a 21-year-old Black heterosexual participant from Study 1c whose femininity had been threatened explained:

> I have heard of similar software before and how it fails when it comes to classifying black women....I am constantly reminded that I am not 'feminine' in the way that I should be and I don't need a beta version software to use my face to reaffirm the same terrible dynamic.

It is unclear, however, how Black women's awareness of White people's biased perceptions of their femininity influenced their psychological responses to the feedback they received. Attributions for this feedback might have influenced participants' responses.

Attributing interpersonal rejection to discrimination, rather than one's own deficiencies, can buffer against the negative effects of rejection on self-esteem (Crocker et al., 1991; Major et al., 2003). Attributing physical femininity threats to racism could similarly protect Black women from the self-esteem-diminishing consequences of such threats. This protection, however, would not necessarily mean that these threats are less globally harmful to Black women than they are to White women—only that they might be less harmful to their self-esteem in the moment. Indeed, a large body of literature demonstrates that chronic experiences with discrimination can result in negative mental health outcomes (Banks et al., 2006; Hatzenbuehler, 2009; Pascoe & Smart Richman, 2009), suggesting that frequent femininity threats could be detrimental to Black women's psychological wellbeing. Attributing femininity threats to racism could also potentially produce anger and physiological activation (Mendes et al., 2008), both of which can be productive, in terms of facilitating approach-oriented coping and collective action (Stürmer & Simon, 2009; Van Zomeren et al., 2012), but also damaging, in terms of long-term mental health consequences (Pittman, 2011).

Examining the effects of attributions for physical femininity threats on Black women's responses to these threats would require manipulating the source of the feedback they receive. For example, participants could be randomly assigned to either a condition in which they are told that they are being evaluated by White raters (and/or that the software assessing their appearance was tested on White women) or a condition in which they are told that they are being evaluated by Black raters (and/or that the software was tested on other

Black women). Participants could then report not only their levels of anxiety and self-esteem but also their attributions for the feedback, their levels of anger, and their desire to engage in collective action. Among participants whose femininity is threatened, I would expect those evaluated by White raters to be more likely than those evaluated by Black raters to attribute their results to racism or racial biases. I would also expect them to consequently report higher levels of self-esteem, more anger, and a greater desire to engage in collective action. I would have no *a priori* predictions about the effects of evaluator race on levels of anxiety, given that both femininity threats and experiences with racial discrimination can produce anxiety (Graham et al., 2015). It is possible, however, that participants in the "White evaluator" condition would attribute their feedback to *both* their racial group membership *and* their actual physical femininity—or in other words, that they would believe that because they are Black, they truly look masculine. If this were the case, I would expect participants who receive femininity threats from a White evaluator to experience particularly high levels of anxiety (Graham et al., 2016; Sosoo et al., 2019).

Alternatively, to avoid potential ethical concerns about subjecting Black women to unnecessary psychological risks, future studies could make use of paradigms that do not involve directly threatening individual participants' femininity. For example, rather than providing participants with feedback about their *own* appearance, researchers could manipulate the salience of beliefs about the appearances of Black women in general (Neel et al., 2013). They could then examine not only anxiety, self-esteem, and anger but also impression management strategies to determine whether Black women who are reminded of beliefs about their ingroup experience negative psychological consequences (Jerald et al., 2017) and/or attempt to present themselves as particularly feminine (Neel et al., 2013).

Additionally, future correlational and qualitative studies could explore potential long-term consequences of frequent physical femininity threats.

Finally, future research should also consider how other women of color respond to physical femininity threats—and femininity threats more generally. Their responses might also differ from those of participants in the current studies, the majority of whom were White. For example, Asian women, who are often stereotyped as hyperfeminine (Pyke & Johnson, 2003), might be particularly distressed by femininity threats, which would suggest that they are not only counter-stereotypical women but also highly counter-stereotypical Asian women. These threats might also be particularly upsetting if they come as a surprise (Wirth et al., 2017). On the other hand, to the extent that Asian women have internalized stereotypes about their ingroup and perceive themselves as highly feminine as a result, they might be less likely than other women to interpret femininity threats as meaningful reflections of reality (Feather & Simon, 1971). Additional research is clearly needed to understand how experiences with femininity threats differ among women with different racial identities.

Sexual Minority Women. Future work would also be advised to examine sexual minority women's experiences with and responses to physical femininity threats. On average, lesbians are perceived as more physically masculine than heterosexual women (Lyons et al., 2014; Rieger et al., 2010; Johnson et al., 2007), and in some cases, lesbians intentionally present themselves as masculine as a form of identity expression (Halberstam, 1996; Rubin, 2006). Lesbians are also often stereotyped as having masculine personalities (Blashill & Powlishta, 2009; Kite & Deaux, 1987; Taylor, 1983). Nonetheless, an internal meta-analysis revealed that non-heterosexual women in our samples (which included women who indicated that their sexual orientation was "gay/lesbian/homosexual," "bisexual," "unsure,"

or "other") indeed experienced increased anxiety in response to physical femininity threats, as compared to physical femininity affirmations. And a number of non-heterosexual participants discussed their sexual identity when commenting on the feedback they had received.

For example, a 39-year-old White lesbian from Study 1c whose physical femininity had been threatened noted that the results she had received were consistent with her expectations and gender presentation, saying:

> I am a very masculine looking middle-aged lesbian, so I wasn't surprised at all. If anything I kind of expected it to say that I was even more masculine looking than it did. I often get mistaken as a man and even when I was a little girl people thought I was a little boy.

On the other hand, a 38-year-old White bisexual participant from Study 2 whose physical femininity had also been threatened noted that that her results were unexpected and questioned whether her sexual orientation had contributed to them:

> I guess I was a little surprised that the software did not see me as feminine. I feel like I am definitely recognized as female and feminine. I am bisexual so I am not sure if that has anything to do with my being less feminine or not but this is something that I now will think about. I generally feel pretty good about myself and the results will not change that, however it was a little surprising and made me think about how i present myself.

An 18-year-old Black lesbian from Study 1c whose physical femininity had been *affirmed* expressed both surprise and satisfaction with her results:

> I've never really perceived myself as a very feminine or even remotely attractive person. Especially as a gay woman on the larger side...who doesn't wear makeup or typically feminine clothing. I've always thought others - both men and women - perceived me as much more masculine and unattractive than the average female, which I've never really liked very much. I just wear clothes that are comfortable and practical and I don't feel like wearing makeup would be me being my authentic self. These results were a complete surprise and a nice confidence boost that made me feel better about myself, especially considering that I (as usual) was wearing no makeup at all in the picture. Admittedly, the angle of the picture makes me look better than I think I usually do (hides some of the fat under my chin), but the picture is pretty close to what I actually look like in real life.

Finally, an 18-year-old White bisexual participant from Study 1c whose physical femininity had also been affirmed noted that the results she had received were reassuring, given her sexual identity:

> I am in a lesbian relationship currently and I hate doubting my appearance because one of us will be labeled the boy in the relationship. My results were me being 73% more feminine than other women, which made me happy but after a few minutes guilty. It should not matter and yet because of the stigma, I don't want to look at all masculine.

Together, these comments highlight the variation in gender expression—and responses to physical femininity feedback—that exists among sexual minority women. They also suggest that in some cases, physical femininity feedback may be particularly meaningful for sexual minority women, who may interpret this feedback as a reflection of either their confirmation or their refutation of stereotypes about their sexual orientation group—or in other words, who may experience *stereotype threat* in contexts in which their femininity is evaluated. Future work is needed to compare the extent to which heterosexual and non-heterosexual women experience anxiety in such contexts, as well as to explore individual differences that predict sexual minority women's psychological responses to physical femininity threats.

(How) Do Women with Different Identities Develop Different Definitions of Femininity?. Finally, future research might explore alternative constructions of femininity among women with different identities. Throughout this dissertation, I have focused on understandings of femininity that are both Eurocentric and heteronormative (Collins, 2004). Black and queer women, however, may have more diverse understandings of what it means to be feminine.

Black Women. Although Black women are aware of Eurocentric standards of physical femininity, they may not value them to the same extent that White women do (Cole

& Zucker, 2007; Sekayi, 2003)—and therefore might not be as harmed by them. Indeed, exposure to "mainstream" (i.e., White) television appears to have negative consequences for body image among White but not Black women (Schooler et al., 2004). Furthermore, despite being exposed to White people's negative stereotype about their group (Jerald et al., 2017), initial evidence indicates that Black women are either as satisfied or more satisfied with their bodies than White women are (Grabe & Hyde, 2006; Smith et al., 1999). Although both Black and White women might value physical femininity to the same extent, their understandings of what *constitutes* physical femininity might differ. For example, one study found that wearing makeup is more important to White women than Black women but that wearing feminine clothing is more important to Black women than White women (Cole & Zucker, 2007). Future research is needed to determine whether, when, and how Black women resist understandings of femininity that reinforce racial hierarchy and claim alternative femininities (Eko, 2018).

Sexual Minority Women. Just as White and Black women might, on average, define femininity differently, so, too, might heterosexual and sexual minority women. Although sexual minority women might be more likely than heterosexual women to identify as masculine (Lippa, 2000), even those who identify as highly feminine might be less constrained by hegemonic understandings of femininity than heterosexual women who identify as highly feminine are. This possibility is exemplified by a comment from a 44-year-old Hispanic/Latina bisexual participant from Study 1c whose physical femininity had been affirmed, who said:

> Gender binaries are social constructs that are not only fluid but on a spectrum. I am Queer cis-woman who plays with gender but presents as femme. The results I received seemed to follow this but I have no investment either way.

Femme-identified queer women and other femme-identified individuals (i.e., "femmes") provide examples of challenges to dominant understandings of what it means to be feminine (Blair & Hoskin, 2015). Although relatively few psychological studies have explored the identities and experiences of individuals who identify as femme, those that have have noted several themes that distinguish what it means to be femme from what it means to be hegemonically feminine. In one study focused on a community of sexual minority women, for example, femmes were described as rebellious, courageous, powerful, strong, open, honest, sexual, and aesthetically feminine (Levitt et al., 2003). In another study of femme-identified individuals of a variety of gender identities and sexual orientations, participants described strength, agency, rebellion, and self-actualization as key characteristics associated with femme identity (Blair & Hoskin, 2015).

Femme identity is characterized by its resistance to externally-imposed understandings of what it means to be feminine (i.e., to be assigned female and to be hairless, thin, able-bodied, and White) and by a rejection of femininity in the service of the male gaze (Hoskin, 2019). It is femininity defined and expressed by those who, by virtue of their bodies and/or desires, have been told they are not and never can be sufficiently feminine (Blair & Hoskin, 2015; Hoskin, 2017). Not all queer women or LGBT individuals who identify or present themselves as feminine, however, identify as femme, and even among those who do, restrictive understandings of femininity persist (Taylor, 2018). Further research is therefore needed to explore experiences and traits that predict whether, when, and to what extent non-heterosexual women develop narrow versus inclusive understandings of femininity, as well as the extent to which more expansive conceptualizations of femininity protect women from the negative consequences of femininity threats.

Concluding Thoughts

This dissertation expands research on gender stereotypicality threats by focusing on threats to women's femininity within the domain of appearance. In doing so, it challenges the assumption that men are more constrained by the pressure to be masculine than women are by the pressure to be feminine—and provides a new perspective on how gender stereotypes harm women.

As detailed in this chapter, additional research is needed to answer several questions about femininity and femininity threats that remain unanswered, namely: why women are not distressed by psychological femininity threats; how women behaviorally respond to physical femininity threats; whether physical femininity threats indirectly reinforce stereotypes; whether women of different races and sexual orientations respond differently to physical femininity threats; and when and how women develop different understandings of what it does—and does not—mean to be feminine. Answering these questions will provide a more comprehensive and inclusive understanding of women's experiences with hegemonic femininity, as well as alternative femininities. It will also pave the way for interventions that can support women in coping with threats to their femininity and potentially engaging in collection action to challenge harmful media messages.

Although this chapter laid out several recommendations for future research on femininity threat, it should not be interpreted as a comprehensive list of directions for future research on this topic. More than a call to answer specific questions about how women react when they are told they are not feminine, this dissertation should serve as a broader appeal to social scientists to prioritize research on femininity. The research here focused on one highly consequential aspect of physical femininity, facial femininity, which plays a central role in gender categorization and impression formation (Hester et al., 2020; Oosterhof &

Todorov, 2008; Plemons, 2017; Walker & Wänke, 2017; Wild et al., 2000). However, future research might also consider other aspects of physical appearance, such as hair and body shape, that also inform gender categorization (Goshen-Gottstein & Ganel, 2000; Johnson & Tassinary, 2005; Macrae & Martin, 2007; Martin & Macrae, 2007) and influence women's self-concepts (LaFrance, 2000; Overstreet et al., 2010; Webster & Tiggemann, 2003). Additionally, while the research here focused on one critical but underexamined domain of femininity, physical appearance, future research might consider other consequential domains that have yet to be sufficiently explored—particularly reproductive capacity and motherhood.

In her commentary on the theory of precarious manhood, Chrisler (2013) asserted that womanhood, like manhood, is an achieved status and that this status is earned through both physical beauty and self-sacrificial motherhood. And indeed, decades of theorizing and qualitative research, particularly by sociologists, have lent support to the notion that womanhood and adult femininity are defined largely in terms of motherhood and fertility (Gillespie, 2000, 2003; Letherby, 1999; Wells & Heinsch, 2020). Infertility may be particularly distressing for women (compared to men) because women have relatively few domains other than motherhood in which they can "prove" their femininity or womanhood (Choi et al., 2005; Ying et al., 2015). And women who experience infertility *and* possess physical features that are typically considered masculine (e.g., thick facial and body hair) have described feeling like "freaks" as a result (Kitzinger & Willmott, 2002). Some women who have not had children, however, express concerns that childbirth is inherently *un*feminine (Malacrida & Boulton, 2012). Therefore, more research is needed to understand how physical appearance, fertility, and motherhood all factor into understandings of femininity and womanhood, as well as how women respond to information indicating that they are either

infertile or inadequately maternal. By prioritizing research on femininity more broadly, psychologists will be able to address the manifold ways in which gendered expectations and pressures shape women's lives.

Finally, the work presented in this dissertation speaks to the question of what femininity and masculinity are—and what they are not. Over the course of the 20th century, the relative associations between feminine personality traits and women, compared to feminine personality traits and men, weakened (Bhatia & Bhatia, 2020). In recent decades, women have decreasingly reported possessing feminine personality traits and increasingly reported possessing masculine personality traits (Bem, 1974; Prentice & Carranza, 2002; Donnelly & Twenge, 2017; Twenge, 1997). And in a series of studies published twenty years ago, participants predicted that by the year 2050, women and men would possess comparable levels of masculine personality traits (Diekman & Eagly, 2000). Furthermore, in Chapter 2 of this dissertation, as in past work (Vandello et al., 2008), I found that women did not experience anxiety in response to threats to the femininity of their personalities.

If women are decreasingly describing themselves in terms of feminine personality traits and increasingly describing themselves in terms of masculine personality traits, and if they are not bothered by information suggesting that they lack feminine personality traits and possess masculine personality traits, then in what sense are these traits really "feminine" and "masculine"? The most recent research suggests that women still describe their personalities as more feminine than masculine (Donnelly & Twenge, 2017) and that both descriptive and prescriptive stereotypes about women's personalities endure (Prentice & Carranza, 2002; Eagly et al., 2020; Haines et al., 2016). However, given that perhaps the strongest prescriptive stereotypes about women focus on physical appearance (Parker et al., 2017), that the relative associations between women and feminine personality traits are

weakening (Bhatia & Bhatia, 2020), that the gap between women's identification with feminine and masculine personality traits is shrinking (Donnelly & Twenge, 2017), and that women and men are expected to have comparable levels of masculine personality traits in thirty years (Diekman & Eagly, 2000), it may eventually be the case that using the terms "feminine" and "masculine" when referring to personality traits no longer makes sense.

Women and men are still expected to *look* quite different in thirty years, however (Diekman & Eagly, 2000), and as this dissertation makes clear, the pressure on women to look feminine—and not look masculine—remains strong. Fully understanding the harm that gender stereotypes cause clearly requires attending to physical appearances. Men may be similarly impacted by threats to their physical and psychological gender stereotypicality, but women are not. If we are to understand the unique experiences of women, we must consider how they respond to and cope with the pressure to appear physically feminine. This dissertation serves as a call to action and as a jumping-off point for this work.

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Appendix A

Supplemental materials for Chapter 2 are presented here.

Study 1a

Measures

Table A1
Study 1a Gender Identity Centrality Items Correlation Matrix

Variables	1	2	3	4	5	6	7	8
1. Being a female is an important part of my self image	--							
2. Being a female is unimportant to my sense of what kind of person I am (R)	.57***	--						
3. Being a female is an important reflection of who I am	.85***	.56***	--					
4. Being a female has very little to do with how I feel about myself (R)	.57***	.71***	.52***	--				
5. Being feminine is an important part of my self image	.68***	.44***	.67***	.48***	--			
6. Being feminine is unimportant to my sense of what kind of person I am (R)	.62***	.63***	.60***	.64***	.70***	--		
7. Being feminine is an important reflection of who I am	.75***	.49***	.69***	.55***	.89***	.74***	--	
8. Being feminine has very little to do with how I feel about myself (R)	.56***	.50***	.48***	.59***	.64***	.68***	.68***	--

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table A2
Study 1a Loadings of Gender Identity Centrality Items onto Factor Identified in Principal Components Analysis with Varimax Rotation

	Gender identity centrality
Being feminine is an important reflection of who I am	0.892
Being feminine is unimportant to my sense of what kind of person I am (R)	0.857
Being a female is an important part of my self image	0.856
Being feminine is an important part of my self image	0.847
Being a female is an important reflection of who I am	0.822
Being feminine has very little to do with how I feel about myself (R)	0.779
Being a female has very little to do with how I feel about myself (R)	0.762
Being a female is unimportant to my sense of what kind of person I am (R)	0.736

Supplemental Measures

Self-perceived sexual attractiveness and attractiveness of personality. We measured self-perceived sexual attractiveness and attractiveness of personality for exploratory purposes. Both forms attractiveness were measured using single-item, 7-point measures. Participants rated their sexual attractiveness on scales ranging from "I am not very sexually attractive" to "I am very sexually attractive" (Wade, 2000) and the attractiveness of their personality on a scale ranging from "My personality is not very appealing" to "My personality is very appealing."

Results

Supplemental Primary Analyses

Because the plurality of participants (n=48; 22.22% of the sample) reported no anxiety and thus the distribution of state anxiety was positively-skewed, we also transformed state anxiety into a binary variable with 0=anxiety absent and 1=anxiety present. We then ran a binary logistic regression to determine whether physical femininity feedback had an effect on whether participants reported *any* state anxiety. We dummy coded physical femininity feedback and physical attractiveness feedback with affirmation as the reference group for both variables. We found that participants in the physical femininity threat

condition were more likely to report any state anxiety (87.18%) than those in the physical femininity affirmation condition (67.44%), $B = 1.19$, $SE = 0.41$, $p = .004$, $OR = 3.28$ [1.47, 7.34]. In other words, the odds of reporting any anxiety (probably of reporting anxiety/probably of reporting no anxiety) were 3.28 times greater among those in the physical femininity threat condition (6.80 odds) than those in the physical femininity affirmation condition (2.07 odds). Participants in the physical femininity control condition were not more likely to report any state anxiety (80.77% or 4.20 odds) than those in the physical femininity affirmation condition, $B = 0.71$, $SE = 0.42$, $p = .095$, $OR = 2.03$ [0.88, 4.64]. Physical attractiveness feedback had no effect on likelihood of reporting any state anxiety, $B = 0.01$, $SE = 0.34$, $p = .988$, $OR = 1.01$ [0.52, 1.95]. There were no interactions between physical femininity feedback and physical attractiveness feedback (ps > .70).

Supplemental Exploratory Analyses

Self-perceived attractiveness. For exploratory purposes, we examined whether the manipulations affected self-perceived sexual attractiveness and attractiveness of personality. Neither physical femininity feedback nor physical attractiveness feedback—nor the interaction between these two variables—affected self-perceived sexual attractiveness or attractiveness of personality, ps > .07.

Study 1b

Measures

Supplemental Measures

Self-perceived sexual attractiveness and attractiveness of personality. We measured sexual attractiveness and attractiveness of personality using the same single-item, 7-point measures used in Study 1a.

Desire to change photograph. Participants indicated whether, if given the opportunity, they would want to replace the photograph they uploaded with a different one.

Results

Supplemental Primary Analyses

Because the modal state anxiety score was 1 (n=30; 12.20% of the sample), indicating no anxiety, and the distribution of state anxiety was positively-skewed, we also transformed state anxiety into a binary variable with 1=anxiety present and 0=anxiety absent. We then ran a pre-registered binary logistic regression, as pre-registered, to determine whether physical femininity feedback had an effect on whether participants reported any state anxiety. We dummy coded physical femininity feedback and physical attractiveness feedback with affirmation as the reference group for both variables. None of the dummy variables, nor the interactions among them, predicted likelihood of reporting any state anxiety, *p*s>.20.

Supplemental Exploratory Analyses

Self-perceived attractiveness. For exploratory purposes, we examined whether the manipulations affected self-perceived sexual attractiveness and attractiveness of personality. Neither physical femininity feedback nor physical attractiveness feedback—nor the interaction between them—affected self-perceived sexual attractiveness, *p*s > .30.

Neither physical femininity feedback nor physical attractiveness feedback affected self-perceived attractiveness of personality, *p*s > .45. Surprisingly, there was a significant interactive effect between physical femininity feedback and physical attractiveness feedback on self-perceived attractiveness of personality, $F(2, 240) = 3.05$, $p = .049$, $f = 0.16$. When we broke down this interaction, however, we found that there was not a significant effect of physical femininity feedback on self-perceived attractiveness of personality in either the

physical attractiveness affirmation condition, $F(1, 110) = 0.74$, $p = .480$, $f = 0.12$, or the physical attractiveness control condition, $F(1, 130) = 2.70$, $p = .071$, $f = 0.20$.

Desire to change photograph. We sought to determine whether participants whose physical femininity (or attractiveness) was threatened would be more likely than those whose physical femininity (or attractiveness) was affirmed to want to replace the photograph they had uploaded with a new one. We dummy coded physical femininity feedback and physical attractiveness feedback with affirmation as the reference group for both variables and then ran a binary logistic regression with these dummy-coded variables and the interactions between them as predictors. This analysis revealed a main effect of physical attractiveness feedback, $B = -0.76$, $SE = 0.29$, $p = .008$, $OR = 0.47$ [0.27, 0.82], such that the percent of participants who would want to replace their photograph was smaller among those who physical attractiveness was affirmed (24.78%) than those who did not receive feedback on their physical attractiveness (40.60%). The odds of wanting to replace one's photograph among participants whose physical attractiveness was affirmed (0.33) were about half the odds of wanting to replace one's photograph among participants who did not receive feedback on their physical appearance (0.68).

There was no effect of physical femininity feedback on participants' desire to replace their photograph (threat vs. affirmation: $B = -0.22$, $SE = 0.32$, $p = .486$, $OR = .80$ [0.43, 1.49]; control vs. affirmation: $B = -0.12$, $SE = 0.36$, $p = .729$, $OR = .88$ [0.44, 1.79]), nor any interactions, ps>.07.

Study 1c

Measures

Supplemental Measures

Self-perceived sexual attractiveness and attractiveness of personality. We measured self-perceived sexual attractiveness and attractiveness of personality using the single-item, 7-point measures used in Studies 1a and 1b.

Desire to change photograph. As in Study 1b, participants indicated whether, if given the opportunity, they would want to replace the photograph they uploaded with a different one.

Results

Supplemental Primary Analyses

Because the modal state anxiety score was 1 (n = 65; 14.19% of the sample) and the distribution of state anxiety was positively-skewed, we also transformed state anxiety into a binary variable with 1=anxiety present and 0=anxiety absent. We then ran a pre-registered binary logistic regression to determine whether physical femininity feedback had an effect on whether participants reported any state anxiety. We dummy coded physical femininity feedback, with affirmation as the reference group, and lists of physical features, with absence of these lists as the reference group. We found that participants in the physical femininity threat condition were more likely to report any state anxiety (90.99%) than those in the physical femininity affirmation condition were (80.93%), $B = 0.87$, $SE = 0.29$, $p = .003$, $OR = 2.38$ [1.35, 4.19]. In other words, the odds of reporting any anxiety were 2.38 times greater among those in the physical femininity threat condition (10.10 odds) than those in the physical femininity affirmation condition (4.24 odds). There was no effect of listing physical features on presence of anxiety, $B = 0.003$, $SE = 0.27$, $p = .993$, $OR = 1.00$ [0.59, 1.71], nor

an interaction between listing physical features and physical femininity feedback, B = -0.33, SE = 0.57, p = .564, OR = 0.72 [0.23, 2.21].

Supplemental Exploratory Analyses

Self-perceived attractiveness. For exploratory purposes, we examined whether the manipulations affected self-perceived physical attractiveness, sexual attractiveness, and attractiveness of personality with three 2 x 2 between-subjects ANOVAs with physical femininity feedback and lists of physical features as the independent variables. There was an effect of listing physical features on self-perceived sexual attractiveness, $F(1, 454) = 6.86$, $p = .009$, $f = 0.12$, such that those in the lists present condition perceived themselves as more sexually attractive (M = 4.32, SD = 1.48) than those in the features absent condition (M = 3.94, SD = 1.64). There were no other main or interactive effects on any of the measures of self-perceived attractiveness, ps $\geq$ .10.

Desire to change photograph. As in Study 1b, we considered whether participants whose physical femininity was threatened would want to replace the photograph they had uploaded with a new one. We were also interested in whether this effect, if present, would be limited to participants who saw lists of physical features that supposedly contribute to overall assessments of facial masculinity/femininity. We dummy coded physical femininity feedback (with affirmation as the reference group) and lists of physical features (with absence of these lists as the reference group) and then ran a binary logistic regression with these dummy-coded variables and the interaction between them as predictors. This analysis revealed a main effect of physical femininity feedback, B = 1.26, SE = 0.21, $p < .001$, OR = 3.53 [2.34, 5.32], such that the percent of participants who would want to replace their photograph was smaller among those who physical femininity was affirmed (21.19%) than those whose physical femininity was threatened (49.10%). The odds of wanting to replace one's

photograph among participants whose physical femininity was threatened (0.96) were 3.53 the odds of wanting to replace one's photograph among participants whose physical femininity was affirmed (0.27). There was no effect of listing physical features on desire to change photograph, B = -0.25, SE = 0.21, p = .233, OR = 0.78 [0.52, 1.17], nor an interaction between physical femininity feedback and listing physical features, B = 0.40, SE = 0.42, p = .342, OR = 1.49 [0.66, 3.39].

Study 2

Measures

Table A3
Study 2 Loadings of Felt Identity Invalidation Items onto Factors Identified in Principal Components Analysis with Varimax Rotation

	Felt gender identity invalidation (reverse-scored items)	Felt gender identity invalidation (regularly scored items)	Felt global identity invalidation
I feel validated as a female [male] (R)	0.827	0.131	0.21
I feel validated as a woman [man] (R)	0.825	0.16	0.202
I feel validated as feminine [masculine] (R)	0.82	0.165	0.202
I feel that my identity as a woman [man] is recognized by others (R)	0.736	0.294	0.231
I feel that my identity as feminine [masculine] is recognized by others (R)	0.73	0.285	0.239
I feel that my identity as a female [male] is recognized by others (R)	0.727	0.308	0.202
I am concerned that others do not recognize my womanhood [manhood]	0.236	0.843	0.165
I am concerned that others do not recognize my femininity [masculinity]	0.205	0.833	0.169
I am concerned that others do not recognize my "femaleness" ["maleness"]	0.287	0.815	0.147
Other people's sense of who I am aligns with who I feel I am (R)	0.244	0.027	0.811
I do not feel that other people see me for who I really am	0.046	0.285	0.786
I feel that my identity is recognized by others (R)	0.437	0.128	0.694
I feel like the results I received are consistent with my beliefs about who I really am (R)	0.17	0.092	0.258

Table A4

Study 2 Felt Identity Invalidation Items Correlation Matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. I feel validated as a female [male] (R)	--												
2. I feel that my identity as a female [male] is recognized by others (R)	.61***	--											
3. I am concerned that others do not recognize my "femaleness" ["maleness"]	.40***	.50***	--										
4. I feel validated as feminine [masculine] (R)	.73***	.55***	.40***	--									
5. I feel that my identity as feminine [masculine] is recognized by others (R)	.56***	.67***	.44***	.68***	--								
6. I am concerned that others do not recognize my femininity [masculinity]	.34***	.40***	.65***	.38***	.44***	--							
7. I feel validated as a woman [man] (R)	.78***	.58***	.39***	.74***	.58***	.35***	--						
8. I feel that my identity as a woman [man] is recognized by others (R)	.58***	.73***	.45***	.58***	.68***	.39***	.62***	--					
9. I am concerned that others do not recognize my womanhood [manhood]	.35***	.42***	.70***	.37***	.41***	.68***	.40***	.46***	--				
10. I feel that my identity is recognized by others (R)	.48***	.51***	.33***	.47***	.51***	.31***	.47***	.55***	.34***	--			
11. I do not feel that other people see me for who I really am	.28***	.28***	.33***	.28***	.31***	.35***	.30***	.29***	.34***	.50***	--		
12. Other people's sense of who I am aligns with who I feel I am (R)	.38***	.35***	.26***	.37***	.37***	.23***	.36***	.36***	.23***	.57***	.47***	--	
13. I feel like the results I received are consistent with my beliefs about who I really am (R)	.21***	.155**	.15***	.20***	.185**	.15***	.21***	.18***	.17***	.16***	.13***	.19***	--

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Supplemental Measures

Self-perceived attractiveness. We measured self-perceived physical attractiveness, sexual attractiveness, and attractiveness of personality using the single-item, 7-point measures used in Studies 1a-c.

Results

Supplemental Primary Analyses

A 2 x 2 x 2 ANOVA with participant gender, domain, and feedback as the independent variables and state anxiety as the dependent variable revealed a main effect of participant gender, $F(1, 1566) = 16.98$, $p < .001$, $f = 0.10$, such that female participants reported higher levels of state anxiety ($M = 1.93$, $SD = 0.67$) than male participants ($M = 1.79$, $SD = 0.63$). It also revealed a main effect of domain, $F(1, 1566) = 3.10$, $p = .079$, $f = 0.04$, such that participants who received feedback on their appearance reported higher levels of anxiety ($M = 1.89$, $SD = 0.66$) than those who received feedback on their personality ($M = 1.83$, $SD = 0.65$). Additionally, we observed a main effect of feedback, $F(1, 1566) = 30.63$, $p < .001$, $f = 0.14$, such that participants whose gender stereotypicality was threatened reported higher levels of anxiety ($M = 1.95$, $SD = 0.66$) than those whose gender stereotypicality was affirmed ($M = 1.77$, $SD = 0.63$).

These main effects were qualified by two two-way interactions—one between participant gender and domain, $F(1, 1566) = 5.67$, $p = .017$, $f = 0.06$, and one between domain and feedback, $F(1, 1566) = 8.24$, $p = .004$, $f = 0.07$.

Among female participants, there was a significant effect of domain, $F(1, 820) = 8.96$, $p = .003$, $f = 0.10$, such that those who received feedback on their appearance reported higher levels of anxiety ($M = 1.99$, $SD = 0.67$) than those who received feedback on their

personality (M = 1.85, SD = 0.66). Among male participants, there was no effect of domain, $F(1, 750) = 0.19$, $p = .664$, $f = 0.02$.

Furthermore, among participants who received feedback on their appearance, there was a significant effect of feedback, $F(1, 816) = 38.09$, $p < .001$, $f = 0.22$, such that those whose gender stereotypicality was threatened reported higher levels of anxiety (M = 2.03, SD = 0.66) than those whose gender stereotypicality was affirmed (M = 1.75, SD = 0.62). Among participants who received feedback on their personality, the effect of feedback on anxiety was not significant, though it was trending in the same direction, $F(1, 754) = 3.13$, $p = .078$, $f = 0.06$, such that those whose gender stereotypicality was threatened reported marginally higher levels of anxiety (M = 1.87, SD = 0.65) than those whose gender stereotypicality was affirmed (M = 1.79, SD = 0.65).

There was no participant gender x feedback interaction, $F(1, 1566) = 0.07$, $p = .790$, $f = 0.01$.

Because as in Studies 1a-c the modal anxiety score was 1 (n = 192; 12.20% of sample), indicating no anxiety, and the distribution of anxiety scores was positively-skewed, we transformed state anxiety into a binary variable with 1=anxiety present and 0=anxiety absent and ran two binary logistic regressions, one for female participants and one for male participants, to examine whether domain, feedback, and/or the interaction between these variables influenced the likelihood that participants would report any state anxiety.

The binary logistic regression for female participants revealed a marginally significant effect of domain (appearance = 1; personality = 0), B = 0.43, SE = 0.22, $p = .058$, OR = 1.53 [0.99, 2.37], no significant effect of feedback (threat = 1; affirmation = 0), B = 0.27, SE = 0.22, $p = .224$, OR = 1.31 [0.85, 2.03], and a significant domain x feedback interaction, B = 1.16, SE = 0.47, $p = .013$, OR = 3.20 [1.28, 8.00]. Among those who received feedback on

their appearance, there was a significant effect of feedback, $B = 0.95$, $SE = 0.36$, $p = .009$, $OR = 2.57$ [1.27, 5.23], such that those whose physical femininity was threatened were more likely (94.52%) than those who physical femininity was affirmed (87.02%) to report any anxiety. In other words, the odds of reporting any anxiety were 2.57 times greater among those in the physical femininity threat condition (17.25 odds) than those in the physical femininity affirmation condition (6.70 odds). Among those who received feedback on their personality, there was no effect of feedback, $B = -0.22$, $SE = 0.30$, $p = .460$, $OR = 0.80$ [0.45, 1.44].

The binary logistic regression for male participants revealed no effect of domain $B = -0.05$, $SE = 0.22$, $p = .828$, $OR = 0.95$ [0.62, 1.46], a significant effect of feedback, $B = 0.72$, $SE = 0.22$, $p = .001$, $OR = 2.05$ [1.32, 3.18], and no interaction between domain and feedback, $B = 0.72$, $SE = 0.45$, $p = .111$, $OR = 2.06$ [0.85, 5.00]. Those whose masculinity was threatened were more likely (90.72%) than those whose masculinity was affirmed (82.67%) to report any state anxiety. In other words, the odds of reporting any anxiety were 2.06 times greater among those in the masculinity threat condition (9.78 odds) than those in the masculinity affirmation condition (4.77 odds).

Supplemental Exploratory Analyses

State self-esteem. Another 2 x 2 x 2 ANOVA examining the effects of participant gender, domain, feedback, and the interactions among these variables on state self-esteem revealed a main effect of participant gender, $F(1, 1565) = 14.85$, $p < .001$, $f = 0.10$, such that female participants reported lower levels of state self-esteem ($M = 4.06$, $SD = 0.96$) than male participants ($M = 4.25$, $SD = 0.92$). It also revealed a main effect of feedback, $F(1, 1565) = 9.40$, $p = .002$, $f = 0.08$, such that those whose gender stereotypicality was threatened reported lower levels of state self-esteem ($M = 4.07$, $SD = 0.97$) than those whose gender

stereotypicality was affirmed (M = 4.23, SD = 0.92). There was no effect of domain on state self-esteem, $F(1, 1565) = 2.03$, $p = .154$, $f = 0.04$.

The main effects of participant gender and feedback were qualified by two two-way interactions—one between participant gender and domain, $F(1, 1565) = 6.33$, $p = .012$, $f = 0.06$, and one between domain and feedback, $F(1, 1565) = 8.65$, $p = .003$, $f = 0.07$. There was no participant gender x feedback interaction, $F(1, 1565) = 1.06$, $p = .304$, $f = 0.03$.

A pair of one-way ANOVAs revealed a significant effect of domain on state self-esteem among female participants, $F(1, 820) = 8.11$, $p = .005$, $f = 0.10$, but not male participants, $F(1, 749) = 0.58$, $p = .446$, $f = 0.03$. Among female participants, those who received feedback on their appearance reported lower levels of state self-esteem (M = 3.97, SD = 0.98) than those who received feedback on their personality (M = 4.16, SD = 0.93).

Another pair of one-way ANOVAs revealed a significant effect of feedback on state self-esteem within the appearance condition, $F(1, 815) = 19.32$, $p < .001$, $f = 0.15$, but not the personality condition, $F(1, 754) = 0.001$, $p = .980$, $f = 0.001$. Within the appearance condition, those whose gender stereotypicality was threatened reported lower levels of state self-esteem (M = 3.97, SD = 0.98) than those whose gender stereotypicality was affirmed (M = 4.26, SD = 0.93).

Self-perceived attractiveness. We conduced three 2 x 2 x 2 ANOVAs to examine the effects of participant gender, domain, and feedback—and the interactions among these variables—on self-perceived physical attractiveness, sexual attractiveness, and attractiveness of personality. No significant effects emerged (ps > .06). However, we broke down the sample by participant gender to examine potential two-way interactions. The only significant two-way interaction that emerged was an interactive effect of domain and feedback on self-perceived

physical attractiveness among female participants, $F(1, 818) = 4.37$, $p = .037$, $f = 0.07$ (all other interaction ps > .15).

Surprisingly, follow-up one-way ANOVAs revealed an effect of feedback on self-perceived physical attractiveness among female participants who received feedback on the femininity of their personality, $F(1, 393) = 5.56$, $p = .019$, $f = 0.12$, but not female participants who received feedback on the femininity of their appearance, $F(1, 425) = 0.37$, $p = .545$, $f = 0.03$. Among female participants who received feedback on the femininity of their personality, those whose femininity was threatened reported that they were more physically attractive ($M = 4.61$, $SD = 1.34$) than those whose femininity was affirmed ($M = 4.27$, $SD = 1.45$).

Supplemental Potential Mediators

Felt gender identity invalidation. A 2 x 2 x 2 ANOVA examining the potential effects of participant gender, domain, and feedback—and the interactions among these variables—on felt gender identity invalidation revealed a main effect of participant gender, $F(1, 1565) = 8.92$, $p = .003$, $f = 0.07$, such that female participants reported lower levels of felt gender identity invalidation ($M = 2.25$, $SD = 1.17$) than male participants ($M = 2.41$, $SD = 1.10$). There was no effect of domain, $F(1, 1565) = 0.72$, $p = .396$, $f = 0.02$, nor interactions between participant gender and feedback, $F(1, 1565) = 3.35$, $p = .068$, $f = 0.05$, or domain and feedback, $F(1, 1565) = 0.94$, $p = .333$, $f = 0.02$.

There was, however, a participant gender x domain interaction, $F(1, 1565) = 4.95$, $p = .026$, $f = 0.06$. Among male participants, a one-way ANOVA revealed an effect of domain, $F(1, 749) = 4.77$, $p = .029$, $f = 0.08$, such that those in the personality condition reported higher levels of felt gender identity invalidation ($M = 2.50$, $SD = 1.13$) than those in the

appearance condition (M = 2.33, SD = 1.07). Among female participants, there was no effect of domain, $F(1, 820) = 1.22$, $p = .270$, $f = 0.04$.

Results-identity discrepancy. The 2 x 2 x 2 ANOVA examining the potential effects of participant gender, domain, and feedback—and the interactions among these variables—on results-identity discrepancy revealed a main effect of feedback, $F(1, 1566) = 427.72$, $p < .001$, $f = 0.50$, such that those whose gender stereotypicality was threatened felt a greater discrepancy between their results and identity (M = 4.22, SD = 1.81) than those whose gender stereotypicality was affirmed (M = 2.50, SD = 1.48). It also revealed a main effect of domain, $F(1, 1566) = 8.37$, $p = .004$, $f = 0.06$, such that those who received feedback on their appearance felt a greater discrepancy between their results and identity (M = 3.49, SD = 1.91) than those who received feedback on their personality (M = 3.22, SD = 1.79). There was no main effect of participant gender, $F(1, 1566) = 2.11$, $p = .146$, $f = 0.03$.

The main effect of domain was qualified by two two-way interactions—a participant gender x domain interaction, $F(1, 1566) = 4.67$, $p = .031$, $f = 0.05$, and a domain x feedback interaction, $F(1, 1566) = 65.77$, $p < .001$, $f = 0.18$. There was no participant gender x feedback interaction, $F(1, 1566) = 1.18$, $p = .278$, $f = 0.02$.

To probe the first interaction, we broke the sample down by participant gender and conducted a one-way ANOVA with domain as the independent variable. Among female participants, there was an effect of domain, $F(1, 820) = 12.41$, $p < .001$, $f = 0.12$, such that those who received feedback on their appearance felt a greater discrepancy between their results and identity (M = 3.53, SD = 1.96) than those who received feedback on their personality (M = 3.07, SD = 1.77). Among male participants, there was no effect of domain, $F(1, 750) = 0.20$, $p = .652$, $f = 0.02$.

We then broke down the sample by domain and conducted another one-way ANOVA with feedback as the independent variable. Among those in the personality condition, there was an effect of feedback, $F(1, 754) = 66.14$, $p < .001$, $f = 0.30$, such that those whose gender stereotypicality was threatened felt a greater discrepancy between their results and identity ($M = 3.74$, $SD = 1.84$) than those whose gender stereotypicality was affirmed ($M = 2.72$, $SD = 1.60$). Among those in the appearance condition, there was an even stronger effect of feedback, $F(1, 816) = 498.11$, $p < .001$, $f = 0.78$, such that those whose gender stereotypicality was threatened felt a greater discrepancy between their results and identity ($M = 4.65$, $SD = 1.66$) than those whose gender stereotypicality was affirmed ($M = 2.29$, $SD = 1.33$).