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Sexual Orientation Perception Involves Gendered Facial Cues

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Abstract

Perceivers can accurately judge a face's sexual orientation, but the perceptual mechanisms mediating this remain obscure. The authors hypothesized that stereotypes casting gays and lesbians as gender "inverts," in cultural circulation for a century and a half, lead perceivers to use gendered facial cues to infer sexual orientation. Using computer-generated faces, Study 1 showed that as two facial dimensions (shape and texture) became more gender inverted, targets were more likely to be judged as gay or lesbian. Study 2 showed that real faces appearing more gender inverted were more likely to be judged as gay or lesbian. Furthermore, the stereotypic use of gendered cues influenced the accurate judgment of sexual orientation. Although using gendered cues increased the accuracy of sexual orientation judgments overall, Study 3 showed that judgments were reliably mistaken for targets that countered stereotypes. Together, the findings demonstrate that perceivers utilize gendered facial cues to glean another's sexual orientation, and this influences the accuracy or error of judgments.

Keywords

person perception, sexual orientation, gender, face perception, social categorization

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In April 1953, U.S. President Dwight Eisenhower issued Executive Order 10450, requiring that gay men and lesbians be weeded out from federal employment. Expulsion from government and military positions did not need to be substantiated by evidence; anonymous accusation was sufficient. At the height of this "lavender scare" and a broader McCarthyist climate of crisis in America, federal workers alleged to be gay or lesbian were dismissed from government jobs at a rate of approximately 60 per month, and about 2,000 gay men and lesbians were dishonorably discharged from the military each year (Loughery, 1998). Years later, in December 1963, the Canadian government launched a similar security initiative to banish gay men and lesbians from government service. But to accomplish this, these governments faced a perplexing problem. Unlike other social categories such as sex and race, which are perceived at near-perfect accuracy, sexual orientation is not perceptually obvious. This quandary led to the government's development and eventual usage of what was called the "fruit machine"—a psychophysiological "gaydar" machine relying on patterns of pupil dilation. A pattern that presumably suggested an individual was gay or lesbian resulted in termination from federal service. Eventually, the government used this machine to fire hundreds of accused gay men and lesbians. Later, perhaps not surprisingly, the fruit machine was found to be entirely fallacious (Kinsman, 2000). This is one example at a national scale of a simple fact—that knowledge of another person's sexual orientation can, and often does, carry tremendous social implications.

Indeed, learning that someone is gay or lesbian provides a lens for subsequent interaction (Gross, Green, Storck, & Vanyur, 1980) and may increase negative attitudes (Aberson, Swan, & Emerson, 1999; Fiske, Cuddy, Glick, & Xu, 2002). For gay men and lesbians, knowing that another person is gay or lesbian carries obvious implications, such as relationships, community building, and the identification of other in-group members. In the realm of romantic and sexual relations, it is crucial for individuals to recognize others' sexual orientation. A gay man being interested in another man he believes to be gay but is actually straight or a straight man being interested in a woman he believes to be straight but is actually a lesbian could create negative repercussions

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or, in extreme cases, tragic ones. In a high-profile incident in 1995, after a gay man indirectly revealed his interest in a straight man, the straight man felt humiliated, bought a shotgun, and shot him twice in the chest (*People v. Schmitz*, 1998). Clearly, knowing—and worse, mistaking—another's sexual orientation can have serious downstream consequences.

Given the interpersonal implications, it is important to understand the basic mechanisms through which perceivers glean information about another's sexual orientation. Although sexual orientation is not perceptually obvious (i.e., not perceived with near-perfect accuracy, like sex and race), several studies have shown gays and lesbians, as a whole, are distinguished from straight men and women with above chance accuracy from just minimal samples of their appearance and nonverbal behavior. For instance, when given 10-s video clips of men's and women's isolated body movements (using only figural outlines), perceivers were better than chance at judging their sexual orientation. This was true even for just 1-s video clips as well (Ambady, Hallahan, & Conner, 1999).

Undeniably, the most important social cue exploited by perceivers, however, is the face. The face is recognized more accurately and efficiently than most other types of visual information (Yin, 1969). From a fleeting glimpse of it, perceivers rapidly recognize others' identity, emotional states, and the social categories (e.g., sex, race, age) to which they belong (Ekman, 1993; Macrae & Bodenhausen, 2000). Recently, static images of the face were shown to support perceptions of sexual orientation with above chance accuracy (Rule & Ambady, 2008; Rule, Ambady, Adams, & Macrae, 2008; Rule, Ambady, & Hallett, 2009). Remarkably, this accuracy is maintained even under impoverished conditions, such as minimal (40–50 ms) exposure time (Rule & Ambady, 2008; Rule et al., 2009) or the occlusion of major portions of the face (Rule et al., 2008; Rule et al., 2009). This work indicates that facial information carries a reliable signal specifying a target's sexual orientation. What this signal entails, however, remains unclear, and the perceptual mechanisms through which perceivers deduce others' sexual orientation remain largely unknown.

The Social Nature of Sexual Orientation Categorization

A large body of research has investigated how a sexual orientation comes to materialize in individuals, and both congenital and environmental factors appear to play a role. Indeed, it is likely that both have complex, interactive contributions in shaping sexual orientation (American Psychological Association, 2008; Bailey, Dunne, & Martin, 2000; Fausto-Sterling, 2000). The present work, however, is less interested in how sexual orientation comes to be *expressed* and is instead focused on the particular mechanisms through which it is *perceived*.

For perceivers to categorize sexual orientation, they need to have some semantic knowledge about what straight and gay or lesbian categories are in the first place, and they also need to be able to make associations with perceptual information to infer membership (see Murphy, 2002; Rosch, 1978). Surely, same-sex sexual *behaviors* have existed throughout time, but perceptions of sexual orientation do not rely on sexual behavior; they rely on the recognition of another person's *identity*, what that identity means, and how that identity manifests through physical cues. Thus, regardless of whether sexual orientation may be explained by congenital factors or environmental factors, or some combination, what is undeniable is that for sexual orientation perception to occur at all, perceivers require basic knowledge of what straight and gay or lesbian identities are and what perceptually distinguishes them. In other words, observers need stereotypes about sexual orientations to perceive them.[1] To understand observers' stereotypes about sexual orientation categories, it is helpful to review where the categories came from, as it is the foundation for the basic perceptions in question.

Historians and sociologists agree that sexual orientation—as in an individual's identity or underlying disposition—debuted only in the mid-19th century (D'Emilio, 1983; Foucault, 1978; Heine, 2008; Herdt, 1997; Katz, 2007). Until the 1860s, all individuals were assumed to be heterosexual (although the term had not been invented yet), and homosexuality referred to acts and behaviors that were understood as transient crimes against law, nature, or morality (Katz, 2007). This changed in mid-19th-century Europe when a rising biomedical institution took homosexuality, originally describing what people *did*, and transformed it into what people *were*. This is reflected by historian and sociologist Michel Foucault's (1978) indication that "the sodomite had been a temporary aberration [before the mid-19th century]; the homosexual was now a species" (p. 43). In psychiatric practitioners' creation of this species, they produced a social and medical classification—an identity—centered around gender inversion. Authorities began conceptualizing people who might engage in same-sex sexual behaviors, previously seen as transient incidents, as having internal pathologies that were stable over time; these individuals were called gender "inverts" (and only later called "homosexuals"). The defining characteristic of the invert was not that he or she engaged in same-sex sexual behavior. It was that, although his or her physical body was of the correct sex, his or her mind was of the opposite sex ("inverted"). It then followed that because his or her mind belonged to the opposite sex, so too did his or her attractions. Thus, male inverts (gay men) were believed to be attracted to men only because they were psychologically female, and female inverts (lesbians) were believed to be attracted to women only because they were psychologically male (Katz, 2007; Lhomond, 1993). Later in time, the term *invert* transitioned to *homosexual* and *homosexual* to *gay or lesbian*, but the

deep connection between concepts of same-sex sexual behavior and gender inversion never subsided. From their beginnings in Western culture, gender inversion was written into the very foundation of gay and lesbian identities (D'Emilio, 1983; Foucault, 1978; Heine, 2008; Herdt, 1997; Katz, 2007).

The Role of Gender Inversion in Perceiving Sexual Orientation

Although the term *invert* may have lost favor decades ago, the notion that gender inversion is an important part of being gay or lesbian lives on in our cultural knowledge. Today, many people subscribe to the notion that intrinsic gender inversion is pivotal to being a gay man or lesbian (Kite & Deaux, 1987; Lhomond, 1993). Moreover, gay men are often construed as abnormally feminine and lesbians as abnormally masculine, with gay men stereotyped as "sissies" and lesbians stereotyped as "tomboys" (McConaghy & Zamir, 1995). Furthermore, people are likely to believe gay men possess characteristics typical of straight women and lesbians to possess characteristics typical of straight men (Kite & Deaux, 1986). Thus, a powerful, contemporary stereotype about gay men and lesbians—with origins that can be traced back more than a century and a half—is that they are gender inverted.

Just because gays and lesbians are stereotyped as gender inverted should not imply that the stereotype is necessarily inaccurate (although indeed it may lead to overgeneralizing; Judd & Park, 1993).[2] In fact, a large body of work supports the notion that gays and lesbians do tend to exhibit gender-atypical qualities. Using large samples, Lippa (2000, 2005) found that, as a whole, gay men report being more feminine and having more female-typed interests than straight men and that lesbians report being more masculine and having more male-typed interests than straight women. Other work has found similar results, with gays and lesbians tending to exhibit more gender-atypical behavior and interests than their straight counterparts (e.g., Bailey & Zucker, 1995; Rieger, Linsenmeier, Gygax, & Bailey, 2008; Sirin, McCreary, & Mahalik, 2004). These gender-atypical characteristics may be partly explained by congenital influences (e.g., Kirk, Bailey, Dunne, & Martin, 2000; Knafo, Iervolino, & Plomin, 2005; Mustanski, Chivers, & Bailey, 2002) and also partly explained by environmental factors (e.g., see Bailey & Zucker, 1995; Lippa, 2005).

Given the strong links between gender inversion and sexual orientation, it is likely that a heuristic of gender inversion is used to perceive individuals' sexual orientations. Prior work has found that the gender atypicality expressed by gay men and lesbians has a perceptual foundation. Using childhood home videos, children who later identified as gay or lesbian were found to be more gender atypical in overall body movement and speech relative to children who later identified as straight (Rieger et al., 2008). Moreover, two recent studies suggested that gender-atypical cues are used for judgments of sexual orientation from the body and voice. When two gendered cues, the body's motion (swagger and sway) and morphology (male typed and female typed), were conflicting, body stimuli were more likely to be judged gay or lesbian (Johnson, Gill, Reichman, & Tassinary, 2007). Most compellingly, a recent study found that full-body photographs and brief clips of body movement and speech permitted above chance judgments of sexual orientation and that this accuracy was related to gender atypicality (Rieger, Linsenmeier, Gygax, Garcia, & Bailey, 2010). Thus, it may be that gender-atypical cues of the face are also used to judge sexual orientation, and this may portend accurate judgment of sexual orientation. If true, perceivers might rely on facial cues that signal gender inversion, such as mismatching masculine and feminine features, to glean others' sexual orientation.

The Present Research

We propose that one mechanism mediating face-based sexual orientation perception is gender inversion. If true, patterns of facial cues that convey gender inversion, such as mismatching masculine and feminine features, may be used to construe sexual orientation. Although gender-inverted cues were recently shown to play a role in sexual orientation construal of the body and voice (Johnson et al., 2007; Rieger et al., 2010), there are theoretically important differences in how they might be utilized in construals of the face. The stimuli in previous work (body movements, voices, and static body photographs) contained many cues that can be displayed electively. Although nonverbal behavior of the body and voice are typically *not* voluntary (see Ambady, Bernieri, & Richeson, 2000), few would deny that the mannerisms and gait of the body, or the prosody of the voice, or one's voluntary appearance in static body photographs (e.g., clothing, fashion, hairstyle) are not at least subject to some degree of personal control. Indeed, Johnson et al. (2007) found that judgments of sexual orientation relied more heavily on the body's motion (relatively more controllable) than the body's morphology (relatively less controllable). The implication was that sexual orientation perception may require cues that are controllable and tacitly understood as socially communicative.

For example, a man with a masculine body shape but a feminine gait may be construed as gay only because perceivers recognize the feminine gait as an intentional communication (as if it were meant to convey he is gay; Johnson, Pollick, & McKay, 2010). Thus, it is unclear whether gender-inverted cues that are relatively fixed and uncontrollable (and thus not likely to be recognized as intentional) can guide perceptions of sexual orientation. Using static facial photographs, previous work has found greater accuracy for sexual orientation

judgments based on a more controllable facial cue (hairstyle) than for less controllable cues (e.g., eye region; Rule et al., 2008). However, that study did not examine the role of gender inversion.

In Study 1, we manipulate the gendered nature of two independent dimensions of computer-generated faces: their shape and texture. Shape and texture are two fundamental sexually dimorphic dimensions of the face that can be varied independently using 3-D morphing algorithms (Blanz & Vetter, 1999; Bruce & Langton, 1994; Hill, Bruce, & Akamatsu, 1995). Men's face shape, for instance, involves lower eyebrows, more defined jawbones and more hollow cheeks, and an overall squarer appearance, whereas women's face shape involves higher eyebrows, less defined jawbones and rounder cheeks, and an overall rounder appearance. Men's face texture involves overall darker coloring, more facial hair, and thicker eyebrows, whereas women's texture involves overall lighter coloring, very little facial hair, and thinner and more arched eyebrows. Morphing along shape gender and texture gender allows us to precisely examine the effects of an inversion of gendered cues on sexual orientation perception while controlling for other perceptual information. If perceivers exploit gender-inverted cues to glean sexual orientation, then as gender inversion increases (e.g., a masculine shape takes on more feminine texture), gay or lesbian judgments should increase as well.

To permit greater breadth and generalizability, in Study 2 we test whether perceivers rely on gender-inverted cues to glean the sexual orientation of real (rather than computer-generated) faces whose gender inversion is measured (rather than manipulated). If correct, as a real face is perceived to be more gender inverted, gay or lesbian judgments should increase. Moreover, using real faces with self-identified sexual orientations also allows us to explore the mediating role of gender-inverted facial cues for accurate judgment of sexual orientation. Given that stereotypes of gender inversion in many instances may be valid, as described above, it is possible that perceivers' use of gender-inverted cues would influence the accuracy of sexual orientation judgments. However, if the reliance on stereotypes of gender inversion is robust, then perceptions of targets who do not fit their prescribed stereotype should be largely mistaken. In other words, although stereotypes of gender inversion may in many instances be accurate, they might also lead to overgeneralization (Judd & Park, 1993),[3] such that gender-inverted cues guide the sexual orientation perception of faces for which they do not apply. For instance, gender-inverted cues on a straight man or woman might erroneously cue a gay or lesbian interpretation, just as gender-typical cues on a gay or lesbian might erroneously cue a straight interpretation. Although prior work has tended to focus on the perceptual conditions that permit above chance accuracy of sexual orientation judgments, it is unknown what conditions lead to judgments that are significantly mistaken. It is important to test the conditions under which sexual orientation is significantly misguided (i.e., below chance), especially given the implications of mistaking another person's sexual orientation, as discussed above. Thus, in Study 3 we test whether stereotypes of gender inversion—although they may be valid in many instances—nevertheless lead to significant misjudgment with targets who do not conform. In sum, across three studies, we examine the role of gender inversion in perceiving sexual orientation from the face and how this may mediate judgments of accuracy or, alternatively, error.

Study 1

In the present study, we investigate the relationship between gender inversion and judgments of sexual orientation from precisely controlled computer-generated faces. By manipulating two gendered dimensions of the face, its shape and its texture, we directly examine whether an incompatibility of gendered facial cues increases the probability that a face is perceived as gay or lesbian. Participants were presented with faces that independently varied on shape (extremely masculine shape to extremely feminine shape) and texture (extremely masculine texture to extremely feminine texture). We predict that gay or lesbian judgments should increase when faces with masculine shape take on a more feminine texture and when faces with more feminine shape taken on a more masculine texture. Thus, as faces become more gender inverted, they should be more likely to be construed as gay or lesbian.

Method

Participants. In exchange for partial course credit or $10, 34 undergraduate students participated.

Stimuli. We used FaceGen Modeler (Singular Inversions) to produce highly realistic faces and independently manipulate the gendered information of the faces' shape and texture. Four unique faces (with unique identities) were semirandomly generated. For each of these unique face identities, 25 variants were made by independently varying the shape gender (five levels ranging from extremely masculine to extremely feminine) and texture gender (five levels from extremely masculine to extremely feminine). See Figure 1 for sample stimuli.

Procedure. Participants were presented with each of the 100 target face stimuli in a randomized order. Because of the subtle manipulations of shape gender and texture gender, we expected substantial variability in participants' perceptions of sex (male or female) and gender (masculine to feminine) for each target.[4] We therefore needed to obtain an idiosyncratic sex judgment and gender judgment for each target in each individual participant rather than using judgments that are averaged across a separate independent group of raters (as is done later with real faces in Studies 2 and 3).[5]

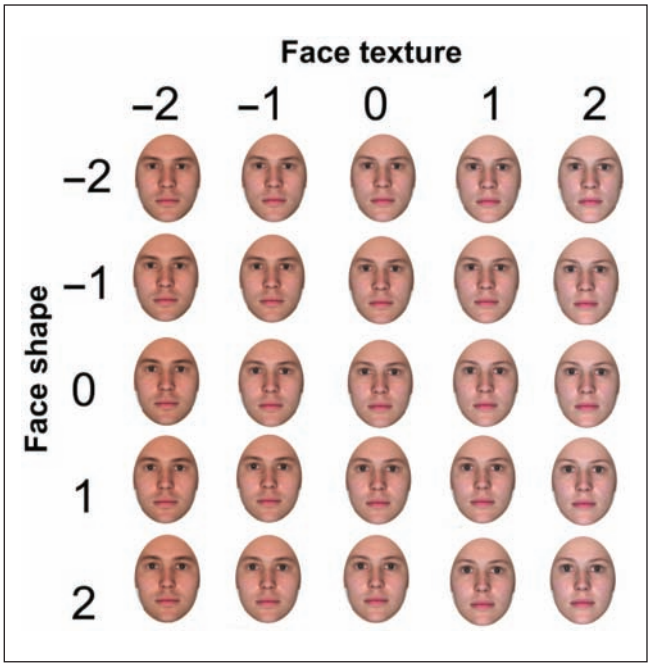

Figure 1. Example stimulus set from one face identity in Study 1, where shape gender and texture gender were independently varied by five levels each.

For each target, participants were asked, in the following order, for a sex judgment (male or female), gender judgment (how masculine or feminine), and a sexual orientation judgment (straight vs. gay or lesbian). For gender judgments, participants were given a horizontal scroll bar with one extreme labeled *extremely masculine* and the other extreme labeled *extremely feminine* and were asked to indicate a corresponding location (recorded as a real number between 0 and 100).

Results

Shape gender and texture gender were coded numerically and centered at 0 (–2 = *extremely masculine*, 0 = *androgynous*, 2 = *extremely feminine*). Gender judgments were centered at 0, and perceived sex and perceived sexual orientation were coded numerically and centered at 0 (–0.5 = *male*, 0.5 = *female*; –0.5 = *straight*, 0.5 = *gay or lesbian*). Because the primary dependent measure (perceived sexual orientation) was categorical and our design was within-subject, we used generalized estimating equations (GEE) to estimate our regression parameters rather than ordinary least-squares regression (Zeger & Liang, 1986). For analyses using GEE models, we report unstandardized regression coefficients (B) and Wald zs. Participant sex had a negligible effect in all analyses and is discussed no further.

Manipulation check. To confirm that our manipulations of a face's shape and texture reliably related to perceptions of sex and gender, we regressed perceived sex (categorical) and perceived gender (continuous), in separate analyses, onto shape and texture. Shape influenced judgments of sex, $B = 0.53$, $p < .0001$, $z = 10.62$, as did texture, $B = 1.89$, $p < .0001$, $z = 17.18$. Expectedly, as shape or texture became more female typed rather than male typed, faces were more likely to be judged as female rather than male. Shape also influenced judgments of gender, $B = 0.06$, $p < .0001$, $z = 5.80$, as did texture, $B = 0.06$, $p < .0001$, $z = 5.80$. As shape or texture became more female typed rather than male typed, faces were more likely to be judged feminine rather than masculine. These analyses verify our manipulations of shape and texture face cues.

Sex and gender on perceived sexual orientation. We initially determined the influences of perceived sex and perceived gender on judgments of sexual orientation, predicting a sex × gender interaction. Specifically, for perceived men gay categorizations should increase when also perceived as more feminine (i.e., more gender inverted), and for perceived women lesbian categorizations should increase when also perceived as more masculine (i.e., more gender inverted). We regressed perceived sexual orientation onto perceived sex, perceived gender, and the interaction. Perceived sex, irrespective of gender, influenced judgments of sexual orientation, such that perceived men were more likely overall to be categorized as gay than perceived women were likely to be categorized as lesbian, $B = –0.57$, $p < .0001$, $z = 4.54$. In addition, perceived gender, irrespective of sex, influenced judgments, such that the extent to which a face was perceived as more feminine, the likelihood of it being categorized as gay or lesbian increased, $B = 0.87$, $p < .01$, $z = 2.81$. More importantly, these main effects of sex and gender were qualified by a significant sex × gender interaction, $B = –11.24$, $p < .0001$, $z = 15.19$, depicted in Figure 2. Specifically, a perceived man was more likely to be categorized as gay when he was also perceived to be more feminine, simple $B = 6.49$, $p < .0001$, $z = 14.11$, and a perceived woman was more likely to be categorized as lesbian when she was perceived to be more masculine, simple $B = –4.75$, $p < .0001$, $z = 9.31$. These results indicate that as gendered facial cues became more incompatible (i.e., gender inverted), gay or lesbian judgments increased.

Shape and texture on perceived sexual orientation. In this focal analysis, we examined whether the incompatibility of precisely manipulated gendered cues of the face (shape and texture) guided participants' perception of sexual orientation. We regressed perceived sexual orientation onto shape gender, texture gender, and the interaction. Shape gender, irrespective of texture, influenced judgments of sexual orientation; as a face's shape became more female typed rather than male typed, gay or lesbian judgments increased, $B = 0.11$, $p < .01$, $z = 2.68$. In addition, texture gender, irrespective of shape, influenced sexual orientation judgments: As a face's texture became more female typed rather than male typed,

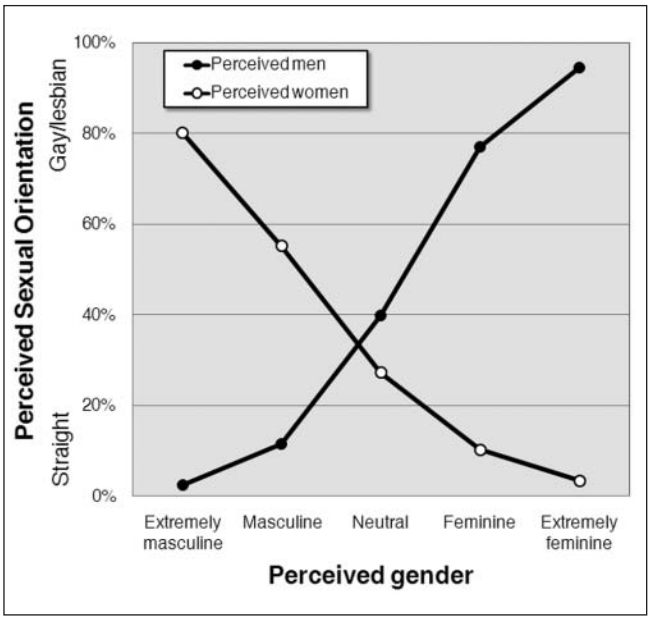

Figure 2. The probability of a gay or lesbian judgment is plotted as a function of perceived gender, separately for perceived men and perceived women (Study 1)

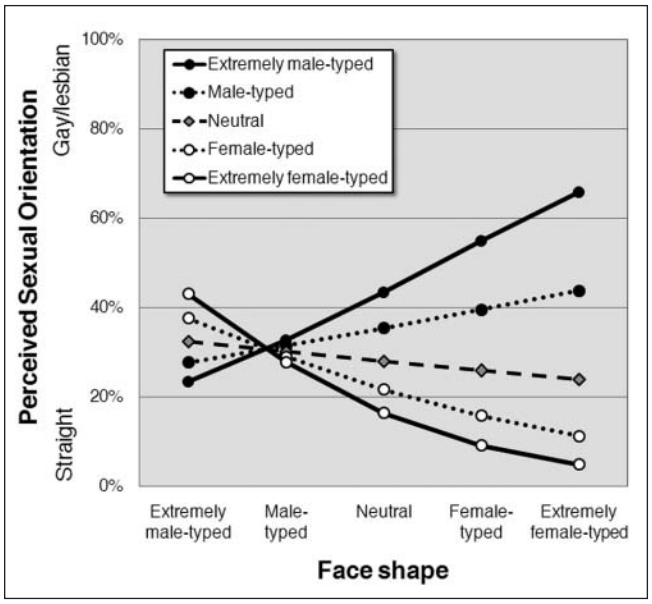

Figure 3. The probability of a gay or lesbian judgment is plotted as a function of shape gender (horizontal axis) at each level of texture gender (different lines), from Study 1

gay or lesbian judgments increased, $B = 0.34$, $p < .0001$, $z = 8.53$. More importantly, there was a significant shape × texture interaction, $B = 0.28$, $p < .0001$, $z = 14.20$, which is presented in Figure 3. For faces with more male-typed textures (values of –2 and –1), as their shape became more female typed (i.e., gender inverted) they were more likely to be categorized as gay or lesbian, simple Bs = –0.46 and –0.18, ps < .0001, zs = 9.24 and 4.43, respectively. For faces with more female-typed textures (values of 2 and 1), as their shape became more male typed (i.e., gender inverted), they were more likely to be categorized as gay or lesbian, simple Bs = 0.68 and 0.39, ps < .0001, zs = 9.66 and 7.82, respectively. Faces with the most androgynous texture (value of 0) were more likely to be judged as gay or lesbian as their shape became more female typed as well, simple $B = 0.11$, $p < .01$, $z = 2.68$. Thus, as the incompatibility of two independent gendered cues of the face—its shape and texture—increased (i.e., became more gender inverted), the likelihood of perceiving that face as gay or lesbian correspondingly increased.

Discussion

We found that perceived men were more likely to be judged as gay when seen as more feminine and perceived women were more likely to be judged as lesbian when seen as more masculine. More precisely, as the gendered nature of a face's shape and texture was put into greater conflict, the probability of that face being perceived as gay or lesbian correspondingly increased. This indicates that perceivers use gender-inverted facial cues to infer sexual orientation. Face shape and texture are two fundamental dimensions of the face that reliably differ between the sexes. They are also visually conspicuous and easily manipulated using morphing algorithms (Blanz & Vetter, 1999; Bruce & Langton, 1994; Hill et al., 1995). However, note that our focus on these two facial dimensions is a matter of convenience. We would speculate that any such gendered cues would be candidates for the pattern obtained here. Thus, when combinations of gendered cues are in conflict, the present results suggest that perceivers are likely to detect this gender inversion and infer gay or lesbian membership because of its association with sexual orientation.

Prior work found that gender-inverted cues were also involved in judging sexual orientation from the body and voice (Johnson et al., 2007; Rieger et al., 2010), cues that may be subject to greater control (e.g., gait of the body or clothing). These studies left open the question as to whether sexual orientation perception can be guided by gender-inverted cues that are uncontrollable and unable to be interpreted as intentional. Here, by systematically manipulating the gendered nature of nonexpressive computer-generated faces, we showed that sexual orientation perception may be driven by gendered cues that are relatively uncontrollable and thus unlikely to be deemed intentional.

The precise manipulation of gendered cues using computer-generated faces can make us confident about the relationship between gender inversion and perceptions of sexual orientation from the face, but it lacks ecological validity. To obtain more

generalizable results, in the next study we use real rather than computer-generated faces and measure, rather than manipulate, gender-inverted cues. Crucially, using real faces with self-identified sexual orientations gives us the opportunity to determine how perceivers' use of gender-inverted cues may influence the accuracy of sexual orientation judgments.

Study 2

Here we examine the role of gender inversion in extracting sexual orientation from real faces. Participants were presented with faces of straight men, straight women, gays, and lesbians and asked to judge their sexual orientation. A pretest was conducted to determine the gender typicality or inversion of each target. As has been shown in recent research, perceivers' accuracy should be above chance level in judging sexual orientation. More critically, we expect that as the gender inversion increases (a man is perceived more feminine or a woman is perceived more masculine), the likelihood of perceiving him or her as gay or lesbian should increase. Furthermore, we explore whether perceivers' hypothesized use of gender-inverted cues may influence the accuracy of judgments of sexual orientation.

Method

Participants. In exchange for partial course credit, 27 undergraduate students participated.

Stimuli. Face photographs of straight and gay or lesbian males and females were obtained from public domain personal advertisement websites used in various metropolitan areas across the United States, excluding the participants' local area of Boston. Faces were taken from the 18–25 age group. Only faces that were directly oriented and free from jewelry, moustache, beard, and glasses were selected for use. The first 6 gay or straight and male or female face photographs meeting these criteria from each of 5 metropolitan areas were selected for use in the study. This resulted in 30 straight male faces, 30 gay male faces, 30 straight female faces, and 30 lesbian faces. Faces were removed from their original context and placed onto a white background. Ears and hair were retained in the cropping whereas other extrafacial information was removed. Images were grayscaled and standardized to 3″ × 5″. These 120 faces were pretested ($N = 12$) on judgments of gender. In the pretest, participants were presented with each target and given a horizontal scroll bar with one extreme labeled *extremely masculine* and the other extreme labeled *extremely feminine*. Participants indicated what location along the scroll bar corresponded to the target's apparent gender. This location was recorded as a real number between 0 and 100. Interrater reliability for these pretest gender judgments was quite high: Cronbach's $\alpha = .96$.

Procedure. Participants were asked to categorize the sexual orientation of the 60 male faces and 60 female faces in separate randomized orders. Targets were presented on a computer screen one at a time and categorized either as straight or as gay or lesbian using the keyboard.

Results

Targets' actual sexual orientation and perceived sexual orientation were coded numerically and centered at 0 (–0.5 = *straight*, 0.5 = *gay or lesbian*). The accuracy of perceived sexual orientation was also coded numerically and centered at 0 (–0.5 = *inaccurate*, 0.5 = *accurate*). Pretest gender judgments were recoded such that the maximum value (100) corresponded to extreme gender inversion (for males, extreme femininity; for females, extreme masculinity), whereas the minimum value (0) corresponded to extreme gender typicality (for males, extreme masculinity; for females, extreme femininity). This variable of gender inversion was then centered at 0 (–0.5 = *extremely gender typical*, 0.5 = *extremely gender inverted*). As in Study 1, because the primary dependent measure was categorical (perceived sexual orientation) and our design was within-subject, we used GEE to estimate regression parameters. We adopted this statistical approach for all analyses except for those involving categorization accuracy and error, for which we used signal detection analysis to appropriately control for response bias (Swets, Tanner, & Birdsall, 1961).

Categorization accuracy and error. We initially determined whether participants' categorizations of sexual orientation were accurate. We arbitrarily defined gay and lesbian perceptual information as signal. Thus, for gay and lesbian targets, accurate categorizations were coded as hits and erroneous categorizations as misses; for straight targets, accurate categorizations were coded as correct rejections and erroneous categorizations as false alarms. Participants were significantly above chance level (50%) in their overall categorization accuracy (hits or correct rejections: $M = 67.81\%$, $SE = 0.96\%$), one-sample $t(26) = 18.64$, $p < .0001$, $r = .96$. Participants had a mean perceptual sensitivity (d') of 1.03 ($SE = 0.06$), one-sample $t(26) = 17.34$, $p < .0001$, $r = .96$. There was also a response bias toward categorizing targets as straight rather than gay or lesbian, with a mean criterion (c) of 0.31 ($SE = 0.06$) that was significantly more positive than zero: one-sample $t(26) = 4.99$, $p < .0001$, $r = .70$. See Table 1 for details.

To directly assess the correspondence between actual and perceived sexual orientation, we conducted an additional correlational analysis. Sexual orientation judgments were averaged across participants, resulting in a mean proportion of gay or lesbian judgments for each target face. The point-biserial correlation between actual sexual orientation and perceived sexual orientation was strong, $r_{pb}(118) = .75$, $p < .0001$. That participants were above chance in their judgments of sexual orientation, and the correlation between actual and perceived sexual orientation was strong, indicates

Table 1. Accuracy and Error in the Sexual Orientation Categorizations of Study 2

Gay or lesbian		Straight	
Hits (%)	Misses (%)	Correct rejections (%)	False alarms (%)
57.60	42.40	78.02	21.98

that these face stimuli carried perceptual cues that reliably conveyed sexual orientation. We characterize what these cues may be in the analyses that follow.

Gender inversion on perceived sexual orientation. First, we computed the correlation across targets between gender inversion (i.e., reverse-coded ratings of gender, as described above) and perceived sexual orientation (i.e., the mean proportion of gay or lesbian judgments). This was strong, $r(118) = .65$, $p < .0001$. To examine the relationship more comprehensively, we used multiple regression to assess the relationship between gender inversion and perceived sexual orientation and how this relationship may be moderated by actual sexual orientation. Thus, we regressed perceived sexual orientation onto gender inversion, actual sexual orientation, and the interaction. We included actual sexual orientation in the analysis to examine the relative contributions of actual sexual orientation and gender inversion to perceptions of sexual orientation. We also included the interaction to examine the possibility that gendered cues are utilized for perceptions of sexual orientation differently in actual straight targets versus actual gay or lesbian targets. As would be expected given the accuracy analyses above, actual and perceived sexual orientation were significantly related, with actual gay or lesbian targets more likely judged as gay or lesbian than actual straight targets, $B = 0.30$, $p < .01$, $z = 2.84$. More importantly, gender inversion was significantly related to perceived sexual orientation. As a target was perceived to be more gender inverted, the likelihood of categorizing that target as gay or lesbian increased, $B = 5.19$, $p < .0001$, $z = 12.01$. Specifically, as gender inversion rose for actual gay or lesbian targets, the probability of a gay or lesbian judgment increased, simple $B = 4.85$, $p < .0001$, $z = 11.68$. And as gender inversion rose for actual straight targets, the probability of a gay or lesbian judgment increased as well, simple $B = 5.52$, $p < .0001$, $z = 8.48$, although slightly less robustly. These effects are plotted in Figure 4. The interaction did not reach significance, $B = –0.67$, $p = .32$, $z = 1.00$. This suggests that perceivers used gender-inverted cues to judge sexual orientation and that they used them not only for actual gays and lesbians but for actual straight targets as well.

Gender inversion on the accuracy of sexual orientation judgments. Because sexual orientation judgments had above chance accuracy, in addition to there being a significant relationship between gender inversion and actual sexual orientation, $r_{pb}(118) = .61$, $p < .0001$, we reasoned that the use of

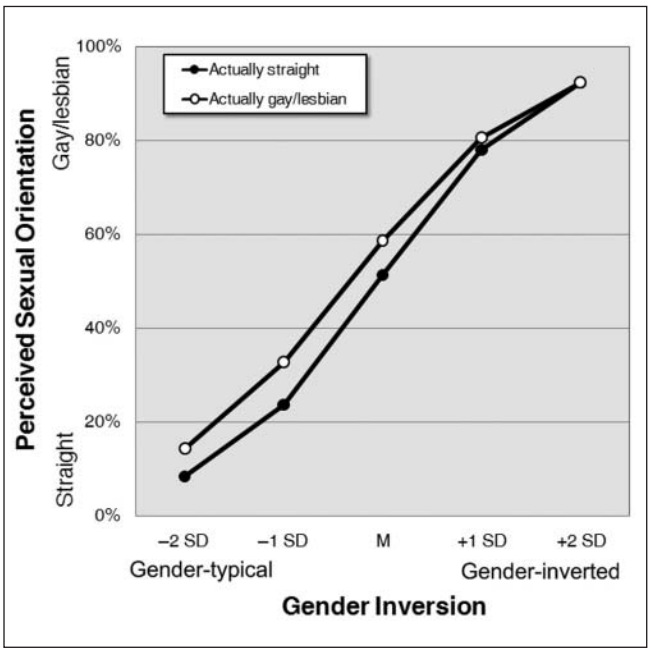

Figure 4. The probability of a gay or lesbian judgment is plotted as a function of ratings of gender inversion (reverse-coded ratings of gender), separately for actual gay or lesbian targets and actual straight targets (Study 2).

gender-inverted cues might underlie the accurate judgment of sexual orientation. To assess this, we used multiple regression to examine how gender inversion and actual sexual orientation were related to the accuracy of sexual orientation judgments. We expected an actual sexual orientation × gender inversion interaction. If the use of gender-inverted cues portends accuracy, then actual gay or lesbian targets should be perceived more accurately as gender inversion rises but actual straight targets perceived more accurately as gender inversion falls. Gender inversion, by itself, did not relate to accuracy, $B = –0.30$, $p = .34$, $z = 0.95$. Actual sexual orientation, however, did have a marginally significant relationship with accuracy, with actual gay or lesbian targets overall categorized more accurately than actual straight targets, $B = 0.45$, $p = .06$, $z = 1.89$. More importantly, there was a significant interaction, $B = 10.33$, $p < .0001$, $z = 12.18$, shown in Figure 5. For actual gay or lesbian targets, accuracy rose as gender inversion increased, simple $B = 4.86$, $p < .0001$, $z = 11.63$. But for actual straight targets, accuracy rose as gender inversion decreased, simple $B = –5.47$, $p < .0001$, $z = 8.76$. Thus, gender-inverted cues influenced accurate perceptions of sexual orientation.

Discussion

Consistent with previous research, we found that participants had better than chance accuracy in judging sexual orientation from the face. In Study 1, using computer-generated faces,

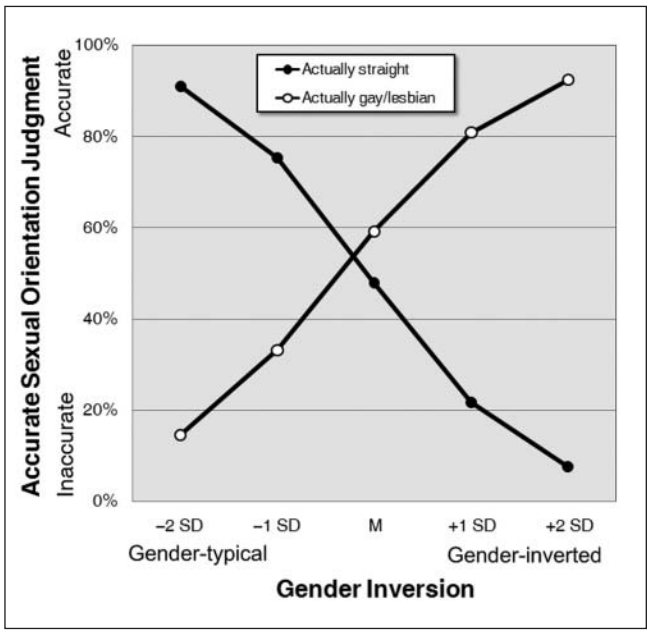

Figure 5. The probability of an accurate sexual orientation judgment is plotted as a function of ratings of gender inversion (reverse-coded ratings of gender), separately for actual gay or lesbian targets and actual straight targets (Study 2).

we found that judgments of sexual orientation utilized gender-inverted cues, and here we extended this utilization of gender-inverted cues to judgments of real, ecologically valid faces. Specifically, as a face was perceived to be more gender inverted, the likelihood of construing that face as gay or lesbian correspondingly increased. Furthermore, we found that perceivers' use of gender-inverted cues increased the accuracy of sexual orientation judgments. As an actual gay or lesbian target became more gender inverted and as an actual straight target became less gender inverted, perceptions of sexual orientation increased in accuracy. Thus, perceivers exploited gender-inverted cues to glean sexual orientation, and their use of these cues portended the accurate judgment of sexual orientation.

Although the effect of gender inversion on perceived sexual orientation was quite strong, the influence of actual sexual orientation on perceived sexual orientation nevertheless remained significant when entered alongside gender inversion in a regression model. Thus, although gender-inverted cues play a powerful role in perceptions of sexual orientation from the face, and although the reliance on these cues predicts accurate judgment, there are likely other facial cues beyond gendered ones that convey sexual orientation. Future research will need to examine these. However, it is also possible that the relationship between actual and perceived sexual orientation holds after accounting for the influence of gender inversion simply because not all the gendered cues that are used to perceive sexual orientation are actually reflected in perceivers' explicit ratings of gender.

As described earlier, many studies have found that gays and lesbians, as a whole, tend to be more gender atypical than straight men and women (e.g., Bailey & Zucker, 1995; Lippa, 2005; Rieger et al., 2008; Sirin et al., 2004) and that this is evident through physical cues of the body (Johnson et al., 2007; Rieger et al., 2008; Rieger et al., 2010). Here we extended this pattern to physical cues of the face and showed how using these cues as a perceptual heuristic increases the accuracy of sexual orientation judgments. One striking finding of the present study is the robust nature of this heuristic for judging sexual orientation. Regardless of targets' actual sexual orientation, the more gender inverted they appeared, the more likely they were judged as gay or lesbian, and the more gender typical they appeared, the more likely they were judged as straight. Although this did lead to more accurate judgments overall, it also implies that one's use of gender inversion stereotypes will reliably induce mistakes when confronted with targets who do not fit prescribed stereotypes. Although the emphasis thus far has focused on how gender inversion affects accuracy in perception, it is equally important to consider how it leads to misjudgment. Although stereotypes of gender inversion, on average, aid in bringing about accurate judgments of sexual orientation, they might also lead to overgeneralizations where a gender-inverted straight face is mistaken to be gay or lesbian and a gender-typical gay or lesbian face mistaken to be straight. Thus, perceivers may be accurate when targets fit their stereotypes but may be reliably mistaken when targets do not conform. We test this in the next study.

Study 3

We investigate whether, when confronted with counterstereotypic faces, judgments of sexual orientation are reliably mistaken. Prior work has reported above chance accuracy in judging sexual orientation from the face (Rule & Ambady, 2008; Rule et al., 2008), as we also found in Study 2. In Study 2, we also found that perceivers' use of gender-inverted facial cues guided perceptions of sexual orientation and influenced accuracy. Although on average using a heuristic of gender inversion produced accurate judgments of sexual orientation, the findings of Study 2 also imply that sexual orientation judgments may be reliably misguided when targets do not fit their prescribed stereotypes. If true, when participants are presented with counterstereotypic faces, accuracy should not be just at a level of chance but should actually fall significantly below. Gender-typical gays or lesbians should be mistaken as straight and gender-inverted straight men and women should be mistaken as gay or lesbian.

Method

Participants. In exchange for partial course credit or $10, 24 undergraduate students participated.

Stimuli. Using the same criteria of Study 2, a larger sample of 80 straight male faces, 80 gay male faces, 80 straight female faces, and 80 lesbian faces was obtained from public domain personal advertisement websites. Stimuli were prepared using the same procedures of Study 2. These 320 faces were pretested ($N = 10$) on judgments of gender. Interrater reliability was quite high: Cronbach's $\alpha = .97$. In the pretest, participants were presented with each target along with a scale ranging from 1 to 7. If the target was male, the endpoints read *masculine male* and *feminine male*; if the target was female, the endpoints read *masculine female* and *feminine female*. Judgments were recoded such that lower scores indicated more gender typicality and higher scores indicated more gender inversion. For each of the four target types (straight men, gay men, straight women, lesbians), we selected the top 25% of faces whose apparent gender was judged most counterstereotypic. That is, we selected the top 20 straight men who were rated most gender inverted, the top 20 gay men who were rated most gender typical, the top 20 straight women rated most gender inverted, and the top 20 lesbians rated most gender typical. These 80 counterstereotypic faces were used for the primary task. Note that these targets were not extreme exemplars; rather, they represented a relatively large (25%) proportion of each target type.

Procedure. Participants were presented with each target in a randomized order and asked to categorize it either as straight or as gay or lesbian.

Results

As in Study 2, we arbitrarily defined gay and lesbian perceptual information as signal. For gay and lesbian targets, accurate categorizations were coded as hits and erroneous categorizations as misses; for straight targets, accurate categorizations were coded as correct rejections and erroneous categorizations as false alarms. In contrast to the results of Study 2 (where participants had above chance accuracy in judging sexual orientation), when categorizing the counterstereotypic faces of the present study, participants were significantly below chance level (50%) in their overall categorization accuracy (hits or correct rejections: $M = 41.30\%$, $SE = 1.30\%$), one-sample $t(23) = 6.69$, $p < .0001$, $r = .81$. Moreover, participants had a negative mean perceptual sensitivity (d') of –0.51 ($SE = 0.07$), $t(23) = 7.33$, $p < .0001$, $r = .84$. As in Study 2, there was also a response bias toward categorizing targets as straight rather than gay or lesbian, indicated by a mean criterion (c) of 0.51 ($SE = 0.06$) that was significantly more positive than zero, one-sample $t(23) = 8.63$, $p < .0001$, $r = .87$. See Table 2 for details.

Table 2. Accuracy and Error in the Sexual Orientation Categorizations of Study 3

Gay or lesbian		Straight	
Hits (%)	Misses (%)	Correct rejections (%)	False alarms (%)
23.13	76.88	59.48	40.52

Discussion

Gender-inverted straight men and women were reliably judged to be gay or lesbian and gender-typical gay men and lesbians were reliably judged to be straight. This was evidenced by accuracy being significantly below chance for sexual orientation judgments of counterstereotypic targets. In Study 2 we found that, overall, judgments of sexual orientation were accurate and, furthermore, that gender-inverted facial cues influenced this accuracy. Thus, although stereotypes of gender inversion may more often than not be valid, here we demonstrate that they are overgeneralized, leading to reliable misjudgment. For the 25% of targets who were least consistent with prescribed stereotypes, perceivers' persistent use of gender-inverted facial cues produced overall erroneous sexual orientation judgments.

The particular conditions that lead to significant misjudgment (i.e., below chance accuracy) in perceiving sexual orientation have not been explored, as most research in addition to Study 2 here has focused on accuracy that is above chance. It is important to test for these, especially given the implications of misjudging someone's sexual orientation, as described earlier. In the present study, we showed that for the 25% of straight men and women who are most gender inverted and for the 25% of gays and lesbians who are most gender typical, judgments of sexual orientation are significantly mistaken.

General Discussion

Across three studies, we investigated the role of gender inversion in perceiving sexual orientation from the face and how this influenced judgments of accuracy or, alternatively, error. In Study 1, using precisely manipulated computer-generated faces, we showed that the presence of gender-inverted cues increased the likelihood of perceiving a face as gay or lesbian. Specifically, when two gendered facial dimensions, shape and texture, were put into a state of greater incompatibility, the face was more likely to be perceived as gay or lesbian. In Study 2, we extended this to real, ecologically valid faces. Consistent with previous research (Rule & Ambady, 2008; Rule et al., 2008; Rule et al., 2009), we found that participants had above chance accuracy in judging sexual orientation from the faces. More importantly, we explicated this accuracy by showing that perceivers used gender-inverted facial cues to glean sexual orientation and, furthermore, that

perceivers' use of these cues portended accurate judgment. We found that faces perceived to be more gender inverted were more likely to be judged as gay or lesbian, and perceivers' use of gender inversion as a heuristic to perceive sexual orientation led to greater accuracy. However, although using this heuristic more often than not led to accurate judgment, we also found that it led to significant overgeneralization. In Study 3, when confronted with the 25% of targets who abided least by their prescribed stereotypes, judgments of sexual orientation were reliably mistaken. Gender-typical gay men and lesbians were reliably judged as straight, and gender-inverted straight men and women were reliably judged as gay or lesbian. Taken together, these findings demonstrate that stereotypes of gender inversion lead perceivers to use patterns of gendered cues to glean others' sexual orientation. Using this heuristic mediated overall accurate judgments of sexual orientation, but in instances of counterstereotypic targets, it led perceivers significantly astray.

The present studies resulted in several novel findings that have theoretical importance for understanding how sexual orientation is perceived. First, we extended previous findings for the role of gender inversion in sexual orientation perception from the body and voice (Johnson et al., 2007; Rieger et al., 2010) to the face. Because the stimuli of this previous work contained cues that were able to be displayed electively (e.g., gait, clothing), it remained unclear whether sexual orientation perception could be influenced by gendered cues that are uncontrollable and unable to be deemed intentional. In Study 1, by precisely manipulating the gendered nature of nonexpressive computer-generated faces, we showed that sexual orientation perception can be guided by gendered cues that are relatively uncontrollable. Thus, although it is possible that perceivers rely more heavily on gendered cues that are controllable for judging sexual orientation if available (e.g., Johnson et al., 2007), here we ensure that gender inversion guides judgments of sexual orientation even when all cues are relatively fixed and not likely to be interpreted as intentionally communicative.

However, it is important to note that the gender inversion measure used with real faces in Studies 2 and 3, unlike the computer-generated faces of Study 1, captured *all* gendered cues on the face, not necessarily only fixed or uncontrollable ones. Thus, dissimilar to Study 1 where we manipulated two static gendered dimensions of the face (shape and texture), the gender inversion measure of Studies 2 and 3 likely reflected all sorts of expressive gendered information beyond just fixed or inbuilt cues. For instance, certain eye gazes, emotional expressions, hairstyles, or other dynamic face information captured in static photographs could have seemed masculine or feminine to perceivers, and these cues would have influenced their ratings accordingly (and thus would have been reflected in the gender inversion measure). Thus, by no means do we wish to imply that perceivers utilize only gendered cues that are relatively fixed and static to perceive sexual orientation (e.g., shape, texture, or other inbuilt features). Instead, we argue that when *any* gendered cues (e.g., a subtle emotional expression typical of the opposite sex, a certain shape and texture, a particular way of looking) become incompatible or inverted, inferences of gay or lesbian membership are likely to increase.

Beyond the perception of sexual orientation in particular, the findings have implications for recent dynamic, integrative, and combinatorial accounts of person construal more broadly (Adams, Franklin, Nelson, & Stevenson, 2010; Freeman & Ambady, 2009; Freeman, Ambady, Rule, & Johnson, 2008; Johnson & Freeman, 2010). These emphasize the role of top-down influences on basic person perception and highlight the simultaneous and interactive use of multiple perceptual cues for categorizing and understanding others. Here we found that perceivers used cultural knowledge (i.e., stereotypes of gender inversion) as a top-down blueprint to categorize sexual orientation, and using this blueprint portended accuracy. To accomplish this, perceivers exploited the combination of multiple simultaneous facial cues (the mismatch or inversion among gendered features). Considering how rapid, robust, and automatic sexual orientation construal is (Rieger et al., 2010; Rule & Ambady, 2008; Rule et al., 2008; Rule et al., 2009), the complexity of its perceptual underpinnings is striking. Interestingly, the findings also show how certain social categories function hierarchically: Information about sexual orientation is built on information about gender.

It is important to note that these studies have no ability to answer the question as to why actual gay and lesbian faces appear to be more gender inverted than those of actual straight men and women or why a stereotypic usage of gender-inverted cues produces accuracy. One possibility is that actual differences in face appearance could be explained by congenital factors that alter physiognomy as a function of sexual orientation. As discussed earlier, prior work has found that gays and lesbians, as a whole, exhibit more gender-atypical behavior and interests than their straight counterparts (e.g., Bailey & Zucker, 1995; Lippa, 2000; Rieger et al., 2008; Sirin et al., 2004), which may be partially heritable (e.g., Kirk et al., 2000; Knafo et al., 2005; Mustanski et al., 2002). It is possible that the tendency of gays' and lesbians' faces to appear more gender atypical could be similarly determined by congenital factors (e.g., prenatal sex-differentiating hormones, which could influence the expression of sexually dimorphic facial features apparent in adulthood; Rahman, 2005).

It is also possible that actual differences in face appearance could be explained by the power of "invert" stereotypes, such that gay men and lesbians, whether consciously or nonconsciously, tend to subtly alter and groom their facial cues in gender-atypical ways to assent to that stereotype and identify with their sexual orientation identity (or perhaps for some other reason), committing, in one sense, a self-fulfilling prophecy. For instance, gay men often come to be more

emotionally expressive (a conventionally feminine personality trait) than straight men (e.g., Lippa, 2000). This gender-atypical expressiveness could lead to a regularity of activation of particular patterns of facial musculature, which, over many years, gradually alters the structure and texture of the face in ways that would appear more gender atypical (Zebrowitz, Collins, & Dutta, 1998). Such gender-atypical personality characteristics potentially expressed by gay men and lesbians could also be communicated in dynamic facial expressions subtly captured in static photographs (Ambady et al., 2000). The findings could also be explained by an amalgamation of both social and congenital factors. The present work, however, did not directly concern the question as to why gay men and lesbians' faces may actually differ from straight men and women's. Rather, it targeted understanding how sexual orientation comes to be judged by perceivers, not expressed by targets. Although the work here cannot and does not seek to address this issue, we *are* able to conclude that it is the association between sexual orientation and gender inversion that helps perceivers distinguish who is gay or lesbian from who is straight.

In summary, although it has long been understood that sexual orientation perception exists, and more recently empirically validated (e.g., Ambady et al., 1999; Rule & Ambady, 2008; Rule et al., 2008; Rule et al., 2009), the perceptual mechanisms underlying it have remained obscure. Here we have revealed one mechanism facilitating these perceptions. Consistent with cultural knowledge nearly a century and a half old, perceivers use combinations of facial cues that together signal gender inversion to infer another's sexual orientation. More often than not, using these cues predicts accurate judgment. But for faces that do not conform to stereotypes, judgments are reliably mistaken.

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The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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Notes

1. Following the recommendations of Judd and Park (1993), we define a stereotype as an individual's set of beliefs about the characteristics of a social group. Note that stereotypes can be either positive or negative and can also be either accurate or inaccurate, although faithfully assessing the latter can be difficult (for a complete discussion, see Judd & Park, 1993).
2. See Note 1.
3. See Note 1.
4. We use the term *sex* to refer to biological sex (male or female) and the term *gender* to refer to the expression of that sex (masculinity and femininity). See Unger and Crawford (1993).
5. Although the idiosyncratic judgments come at the cost of limiting the generalizability of the results (as preceding judgments might influence subsequent ones), the present study focused on precision using computer-generated faces. The cost of not obtaining idiosyncratic judgments would be high because we would not have access to an individual perceiver's perception of sex and gender, which we expected to vary across participants given the subtle manipulations. In contrast, Studies 2 and 3 using real faces focused on generalizability.

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