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ORIGINAL PAPER

Disfluent Processing of Nonverbal Cues Helps to Explain Anti-Bisexual Prejudice

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Abstract Recent studies have documented that metacognitive processes underlying social perception contribute to interpersonal prejudice. For example, individuals categorized as lesbian/gay on the basis of their physical appearance are processed disfluently, and such disfluent processing arouses negative social evaluations. Although this pattern of results has replicated across several independent samples, evidence for the social consequences of perceptual disfluency remains limited to a handful of stigmatized groups. Here, we tested disfluency's effects among a social group that has received scant attention in research on social perception—namely, bisexual individuals. We found that (a) perceivers achieved above-chance accuracy categorizing targets as bisexual versus not bisexual based upon facial photographs, (b) gender-atypical facial features were associated with bisexual categorizations, (c) targets who were categorized as bisexual and targets who personally identified as bisexual were evaluated more negatively than those who were not categorized/identified as bisexual, and (d) disfluent processing of nonverbal cues—especially gendered cues—helped to explain anti-bisexual prejudice. Collectively, these findings contribute to the growing literature on perceptions of sexual orientation and highlight the generalizability of perceptual fluency for understanding diverse forms of prejudice that arise in the early moments of social perception.

Keywords Fluency · Social perception · Social vision · Bisexual · Bisexual prejudice

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Introduction

Despite some progress, sexual minorities continue to experience prejudice at epidemic rates around the globe (Katz-Wise and Hyde 2012). Classic theoretical work suggest that this prejudice persists, at least in part, because it is rooted in the basic social cognitive processes that guide human perception (Allport 1954). Building upon these insights, recent studies pinpointed perceptual disfluency—the difficulty that occurs while processing some social stimuli—as a proximal factor that gives rise to prejudice. For example, people believed to be lesbian/gay are difficult to categorize on the basis of their nonverbal features, and such disfluent processing spawns prejudiced evaluations (Lick and Johnson 2013).

Because perceptual disfluency only recently emerged as a mechanism underlying interpersonal prejudice, evidence for its social consequences is limited to a few publications (see Lick and Johnson in press). It therefore remains unclear whether fluency's social impacts generalize broadly, helping to explain diverse forms of prejudice that arise on the basis of nonverbal cues. To examine this possibility, the current study tested the role of perceptual disfluency in prejudice against a group that has received scant attention in social perception research—namely, bisexual individuals. Below, we provide a brief introduction to the existing literatures on perceptual fluency and anti-bisexual prejudice in order to motivate our test of disfluent processing as a mechanism driving anti-bisexual prejudice.

Perceptual Fluency and Evaluative Judgments

Perceptual fluency describes the ease with which perceivers can identify salient features of a stimulus (Reber et al. 2004). Fluent processing is considered easy on the mind, marked by swift and seamless progress toward stimulus recognition and judgment. Disfluent processing is considered hard on the mind, marked by slow and effortful progress toward stimulus recognition and judgment (Winkielman et al. 2006). Although fluency is determined by myriad experiential factors ranging from frequency of exposure to visual clarity, these various sources of fluency were recently united under a common theory (Alter and Oppenheimer 2009). According to this meta-theory, fluency guides evaluative judgments of diverse stimuli regardless of its origins. For example, fluently named stocks (e.g., Flinks, Tanley) outperform disfluently named stocks (e.g., Safxter, Xagibdan; Alter and Oppenheimer 2006), and fluently processed visual stimuli (e.g., geometric dot patterns) garner higher likeability ratings relative to disfluently processed visual stimuli (e.g., randomly generated dot patterns; Winkielman et al. 2006). Moreover, relative to disfluent processing, fluent processing leads perceivers to evaluate art more favorably (Belke et al. 2010), deem instructions simpler to complete (Song and Schwarz 2008), rate food additives as less risky (Song and Schwarz 2009), and believe currencies to be more valuable (Alter and Oppenheimer 2008). Fluency therefore guides evaluative judgments of diverse stimuli in a remarkably consistent manner.

The breadth of domains in which fluency impacts judgments recently inspired predictions that it might also affect social outcomes, including prejudiced evaluations of other people (Lick and Johnson in press). Some preliminary findings support this possibility. In one study, participants first imagined the experiences of a target who either migrated or did not migrate across groups before indicating how much they liked the target. Participants ultimately disliked migrant targets more than non-migrant targets, partly because they reported difficulty imagining migrants' experiences (Rubin et al. 2010). In another study,

participants indicated that they liked hypothetical targets with fluent surnames (e.g., Mr. Smith) more than hypothetical targets with disfluent surnames (e.g., Mr. Colquhoun; Laham et al. 2012). In a third study, participants found the accented speech of non-native language speakers more difficult to process than the speech of native language speakers, and these processing deficits compromised the perceived credibility of non-native speakers (Lev-Ari and Keysar 2010).

Although the aforementioned work indicates that perceptual fluency predicts social evaluations, the findings are restricted to hypothetical targets and linguistic cues. The impact of perceptual fluency during everyday social interactions in which observers form impressions of others based upon nonverbal features remains less clear. Still, there is some reason to believe that the fluency of processing nonverbal cues directs social evaluations. Indeed, theoretical work suggests that faces that fall far from a category prototype are less attractive than faces that fall closer to a category prototype, perhaps because those further from the prototype are harder to process (Potter and Corneille 2008). Recent empirical studies provide further support for this possibility. For example, Lick and Johnson (2013) found that faces categorized as lesbian/gay were evaluated more negatively than faces categorized as straight, in part because faces categorized as lesbian/gay exhibited gender-atypical nonverbal cues that made them difficult to categorize. Similar effects did not emerge for racial minority targets, suggesting that disfluent processing may have its strongest influence on judgments of relatively ambiguous identities. Halberstadt and Winkielman (2014; Studies 3 and 4) found additional support for these claims, insofar as fluency affected evaluations of perceptually ambiguous racial groups. Specifically, biracial face composites were rated as less attractive and elicited less positive affect than monoracial faces when perceivers experienced difficulty classifying the faces' component races.

Thus, recent studies suggest that the fluency with which people process perceptually ambiguous targets' social identities guides first impressions. Specifically, targets that are difficult to categorize on the basis of their nonverbal features tend to be met with negative social evaluations. Although extant data support these claims, however, stronger conclusions await demonstrations with other groups. Indeed, recent concerns about replication in the social sciences necessitate extensions of existing theory to new populations of both targets and perceivers (Yong 2012). Here, we tested the role of perceptual fluency in social evaluations of a different perceptually ambiguous group that is the target of prejudice—bisexual individuals.

Bisexual Individuals as a Population of Interest

We focused our investigation on bisexual targets for three reasons. First, previous research suggests that fluency may be most useful for understanding evaluations of perceptually ambiguous identities (Lick and Johnson in press). Testing the generalizability of this effect therefore requires replication with groups that face prejudice on the basis of relatively concealable identities. Bisexuality is indeed presumed to be more concealable than many other social identities (e.g., race and sex; Frable et al. 1998), yet it remains theoretically distinct from the categories lesbian/gay (Eliason 2001). Thus, studying bisexual targets provides a logical extension of previous work that documented fluency as a predictor of anti-gay prejudice.

The second reason we focused on bisexual individuals is because they experience startling rates of prejudice across the lifespan (Israel and Mohr 2004). In fact, data from one national probability sample revealed that heterosexual adults express more prejudice against bisexual individuals than they do against all other stigmatized groups aside from

injection drug users (Herek 2002). Despite these sobering statistics, data about the causes and correlates of anti-bisexual prejudice remain limited. Testing perceptual fluency as a predictor of anti-bisexual prejudice therefore offers an important contribution to the relatively scant research in this area.

Finally, we focused on bisexual individuals because research examining perceptions of bisexuality based upon nonverbal cues is almost entirely nonexistent. Although a growing body of literature has examined visual correlates of monosexual categorizations (lesbian, gay, straight; Freeman et al. 2010; Johnson et al. 2007; Lick et al. 2013; Rule and Ambady 2008, 2009), only a single study has examined visual correlates of bisexual categorizations (Ding and Rule 2012). That study offered an initial glimpse into the form and function of bisexual categorizations drawn from facial cues, revealing that categorization accuracy was merely at chance for bisexual targets when perceivers engaged in a trichotomous categorization task (*straight, bisexual, lesbian/gay*) and that observers rated bisexual targets as similar to lesbian/gay targets for judgments that utilized continuous scales of sexual orientation. Still, these findings await replication and extension to clarify the phenotypic cues perceivers use to categorize bisexuality.

The Current Study

In summary, the current study addressed three topics that have received limited attention in research on social perception. First, we sought to replicate and extend recent work on perceptions of bisexuality. Based on findings from Ding and Rule (2012), we predicted that perceivers would show relatively low accuracy when judging bisexuality from facial cues. Second, we sought to provide a preliminary test of the visual correlates of bisexual categorizations. We predicted that gendered phenotypes would be associated with bisexual categorizations because gender-atypical features are the primary cues perceivers use to categorize others as lesbian/gay (Freeman et al. 2010) and because perceivers do not readily distinguish between the categories lesbian/gay and bisexual in social perception tasks (Ding and Rule 2012). Third, and most important, we tested whether perceptual disfluency is associated with anti-bisexual prejudice, defined as lower explicit evaluative ratings of bisexual targets relative to straight targets. We predicted that perceivers would evaluate targets they categorized as bisexual and targets who personally identified as bisexual more negatively than those not categorized/identified as bisexual. Moreover, we predicted that disfluent processing would help to explain such negative evaluations. It is important to note that this disfluency may simultaneously arise from two sources—one originating within the target and the other originating within the perceiver. In terms of disfluency originating with targets, recent studies revealed that gender atypicality is a primary predictor of prejudice against sexual minorities (Lick and Johnson 2014). Although data linking gender atypicality to sexual prejudice have been restricted to lesbian/gay targets, perceivers do not appear to distinguish between the categories lesbian/gay and bisexual in social perception tasks (Ding and Rule 2012), which raises the distinct possibility that similar mechanisms may underlie anti-bisexual prejudice. Put simply, gender-atypical features are by definition atypical; if perceivers associate bisexuality with gender atypicality, then targets categorized as bisexual may be disfluent because of their non-normatively gendered appearances. As for disfluency originating within perceivers, the gender-atypical features described above may cause delays in the processing of bisexual targets. These delays are indicative of disfluent processing at the perceiver level, which portends negative social evaluations. If we are correct that disfluent processing accounts for at least some prejudice against bisexual individuals, then we should see

evidence of its effects at both the target and the perceiver level. Data in support of these predictions would extend recent claims that disfluency contributes to the formation of interpersonal prejudice in the early moments of social perception.

Method

Participants

Eighty-three undergraduates (98 % straight, 71 % female, 37 % White) participated in exchange for course credit.

Stimuli

Stimuli were facial photographs from a previously validated stimulus set (Ding and Rule 2012). The photographs were drawn from online dating profiles located within major U.S. cities, which were identified for inclusion based upon self-reported demographics listed in each profile (age, sex, sexual orientation). After sorting profiles along these dimensions, specific photographs were chosen for inclusion based on the order in which they appeared in the dating website's search feature, which was determined by the time since the user's last login (more recent logins listed first). The final stimulus set included images of 60 real people between the ages of 18–30 years who varied in terms of sex and sexual orientation (30 men: 10 straight, 10 gay, 10 bisexual; 30 women: 10 straight, 10 lesbian, 10 bisexual). All of the target faces were White and devoid of facial hair and visible piercings. Prior to data collection, the images were standardized by cropping the head (face and hair) from the original photograph and converting the resulting images to grayscale.

Procedure

After providing consent, participants completed the study on Macintosh computers running customized stimulus presentation software. Participants viewed each face three times, providing a unique set of judgments in each block. Stimuli were presented randomly within each block, and the order of blocks was counterbalanced across participants. In one block, participants categorized each target's sexual orientation (*not bisexual, bisexual*). In another, participants rated each target on a series of evaluative items: how warmly and positively they felt toward the target (*1 = not at all* to *9 = extremely*), how likeable the target appeared (*1 = not at all* to *9 = extremely*), and their desire to be friends with the target (*1 = no desire* to *9 = high desire*). Thus, on all of the evaluative items, lower scores corresponded to more negative evaluations. In the remaining block, participants rated each target's gendered appearance (*1 = masculine* to *9 = feminine*). Finally, participants provided demographic information before being debriefed.

Analytic Plan

The four evaluative items showed high within-subject reliability ($R_C = 0.96$; for method, see Cranford et al. 2006), so we summed participants' rating for each item into a continuous composite score on which higher values indicated more favorable evaluations. We considered this measure indicative of prejudice to the extent that bisexual targets systematically

received lower evaluations than non-bisexual targets. Following Lick and Johnson (2013), we operationalized fluency as the composite speed with which perceivers categorized each target's gender and sexual orientation, where higher scores indicated slower (more disfluent) processing. We combined these two reaction times as a measure of fluency because previous research has shown that judgments of gender and sexual orientation are closely tethered (Freeman et al. 2010; Johnson et al. 2007; Lick et al. 2013) and happen remarkably quickly, perhaps even automatically (Ito and Urland 2003; Rule et al. 2009a, b). Moreover, gender is a primary feature guiding social judgments in general (Williams 1984), and evaluative judgments related to sexual orientation in particular (Lick and Johnson 2014). Thus, we reasoned that relatively slow sexual orientation/gender judgments would indicate disfluent processing along these related dimensions. Finally, we recoded gender ratings by multiplying judgments by −1 for female targets, such that higher scores indicated more atypical appearances for both sexes (i.e., masculine women, feminine men).[1]

After recoding, we conducted three sets of analyses. First, we used signal detection methods to test whether perceivers accurately judged bisexuality from facial cues. Specifically, we coded correct "bisexual" responses as hits and incorrect "bisexual" responses as false alarms, computing d' as a measure of perceptual sensitivity and c as a measure of response bias using the algorithms described by Stanislaw and Todorov (1999). Second, we conducted a preliminary test of the phenotypic features related to bisexual categorizations. We focused specifically on the association between gendered features (gender-typical, gender-atypical) and bisexual categorizations, because these are the cues that have been most clearly linked to sexual orientation perception in prior work (Freeman et al. 2010; Johnson et al. 2007; Lick et al. 2013). Because each participant provided multiple judgments of multiple targets, we conducted these analyses using generalized estimating equations, which are multilevel regression models that predict both binary and continuous outcomes while accounting for nested data structures (Zeger and Liang 1986). Third, to test our primary hypothesis that disfluent processing helps to explain anti-bisexual prejudice, we employed the multilevel mediation approach outlined by Bauer et al. (2006). This method provided unbiased estimates of indirect effects using Monte Carlo simulations with 10,000 draws. In all analyses, we excluded response latencies more than three standard deviations from the mean as outliers (755/4980 total observations). Finally, we should note that including perceiver sex (male, female) as a factor did not moderate any of the effects reported below (ps $> .271$), so we subsequently dropped perceiver sex from the models and do not discuss it further.

Results

Accuracy and Bias in Bisexual Categorization

We used signal detection analyses to test whether perceivers were sensitive to bisexuality cues in human faces. One-sample t tests revealed that both sensitivity ($M = 0.17$, $SD = 0.35$; $t(81) = 4.27$, $p < .001$, Cohen's $d = 0.49$) and response bias ($M = 0.14$,

[1] To be clear, our analyses distinguish between target sex, which refers to biologically-based categories (male versus female), and target gender, which refers to socially constructed norms for men and women (masculinity vs. femininity; Deaux 1985). Thus, sex categorizations involve the belief that a target is male versus female (binary); gender perceptions involve the belief that a target is masculine versus feminine (continuous).

$SD = 0.39$; $t(81) = 3.22$, $p < .001$, Cohen's $d = 0.36$) were significantly greater than zero. These findings suggest that perceivers were sensitive to bisexuality cues but tended to utilize the "not bisexual" category more than the "bisexual" category. Upon further inspection, we noted that perceivers were most accurate when categorizing lesbian, gay, and straight targets as "not bisexual" (59.94 % correct rejections); perceivers were merely at chance when categorizing bisexual targets as "bisexual" (49.58 % hits; see Table 1). Thus, these findings offer the first evidence of above-chance accuracy in judgments of bisexuality (cf. Ding and Rule 2012), although it is important to note that the accuracy was driven primarily by correct rejections as opposed to hits.

Visual Cues to Bisexuality

Next, we conducted a preliminary analysis of the facial cues associated with bisexual categorizations. The goal of this analysis was to test whether phenotypic features associated with monosexual categorizations (i.e., gender typicality) were also associated with bisexual categorizations. Specifically, we regressed Perceived Sexual Orientation onto Target Sex, Perceived Gender, and their interaction. Consistent with population base rates (Gates 2011), women were categorized as bisexual more often than were men, $B = 0.35$, $SE = 0.09$, $z = 3.68$, $p < .001$. Furthermore, gender-atypical targets were categorized as bisexual more often than were gender-typical targets, $B = 0.39$, $SE = 0.04$, $z = 10.40$, $p < .001$. The two-way interaction was non-significant, $B = -0.03$, $SE = 0.05$, $z = -0.52$, $p = .602$. These findings suggest that sex and gender cues independently guided bisexual categorizations, such that women and gender-atypical targets were especially likely to be categorized as bisexual.

Perceptual Fluency and Anti-Bisexual Prejudice

We then considered whether and why perceivers might express anti-bisexual prejudice (i.e., lower explicit evaluations for bisexual relative to non-bisexual targets) on the basis of nonverbal cues in facial appearance. We first tested whether anti-bisexual prejudice emerged following brief exposure to facial features by regressing Evaluations onto Perceived Sexual Orientation. As expected, targets categorized as bisexual were evaluated more negatively than were targets not categorized as bisexual, $B = -3.15$, $SE = 0.41$, $z = -7.73$, $p < .001$ (Fig. 1a). Next, we tested our primary hypothesis that disfluent processing would help to explain this prejudice against targets categorized as bisexual. We accomplished this using two complementary analyses. First, because gender-atypical cues were associated with bisexual categorizations and those cues are by definition atypical, we used them as a proxy for fluency. If disfluent processing of nonverbal cues drives negative

Table 1 Signal detection parameters for bisexual categorizations (bisexual, non-bisexual)

Hits (%)	Misses (%)	FA (%)	CR (%)	$M_{d'}$ ($SD_{d'}$)	M_c (SD_c)
49.58	50.42	40.06	59.94	0.17(0.35)**	0.14(0.39)*

* $p < .01$; ** $p < .001$

FA false alarms, *CR* correct rejections, d' perceptual sensitivity to bisexual cues in faces, c response bias toward the non-bisexual category

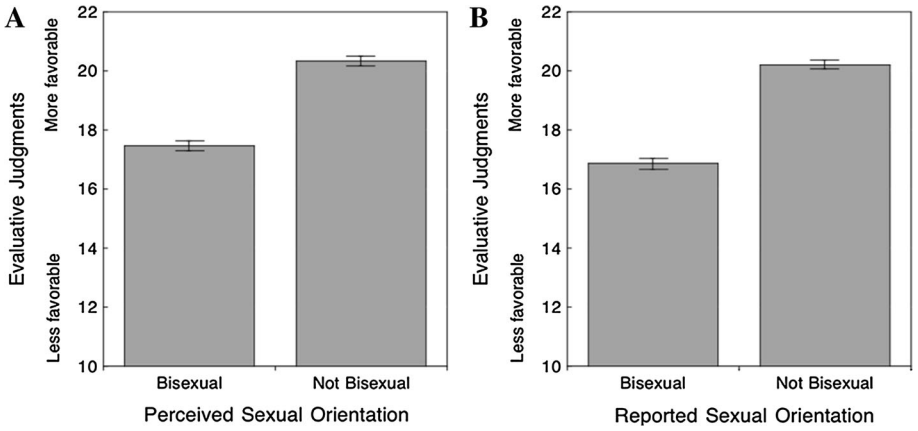

Fig. 1 Significant associations between Perceived Sexual Orientation and Evaluative Judgments (**a**) and Reported Sexual Orientation and Evaluative Judgments (**b**). Perceived Sexual Orientation refers to perceivers' ($N = 83$) assumptions about targets' sexual orientations based upon facial cues, whereas Reported Sexual Orientation refers to targets' ($N = 60$) self-reported sexual orientations. Evaluative Judgments refer to a composite score made up of four explicit evaluations (warmth, positivity, likeability, desire for friendship), where higher values indicate more favorable evaluations. *Error bars* represent standard errors around each mean

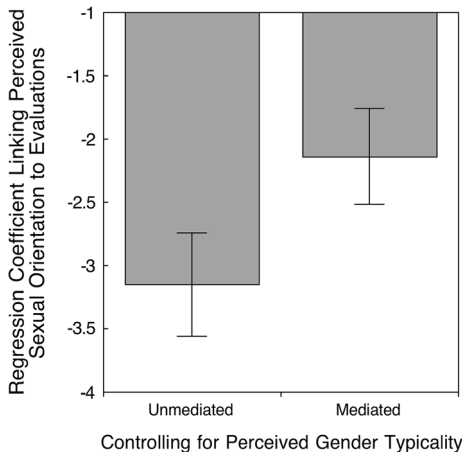

Fig. 2 Significant effect of controlling for Perceived Gender Typicality on the association between Perceived Sexual Orientation and Evaluations. Perceived Gender Typicality refers to perceivers' ($N = 83$) subjective perceptions of each target's masculinity/femininity (*1 = masculine* to *9 = feminine*). The unmediated estimate depicts the basic association between bisexual categorizations and negative evaluations. The mediated effect depicts the association between bisexual categorizations and negative evaluations after controlling for Perceived Gender Typicality. *Error bars* represent standard errors from the multilevel regression model for each effect

evaluations of bisexual individuals, then controlling for bisexual targets' gender-atypical appearances should explain some variance in the prejudice expressed against them. To test this possibility, we re-computed the above regression model linking Perceived Sexual

Orientation to Evaluations after controlling for Perceived Gender. Controlling for Perceived Gender reduced the association between Perceived Sexual Orientation and Evaluations by 32 %, $B = -2.14$, $SE = 0.38$, $z = -5.56$, $p < .001$ (Fig. 2).

Second, we examined response latencies as a measure of perceptual fluency. Recall that our fluency measure combined reaction times for both sexual orientation categorizations and gender ratings because these factors were closely tethered to one another. We began by regressing Fluency onto Perceived Sexual Orientation. As expected, targets categorized as bisexual took longer to process than did targets not categorized as bisexual, $B = 269.12$, $SE = 49.06$, $z = 5.49$, $p < .001$. We also regressed Evaluations onto Fluency. Targets processed disfluently were evaluated more negatively than were targets processed fluently, $B = -0.001$, $SE = 0.0001$, $z = -3.87$, $p < .001$. To test whether Fluency statistically accounted for the association between Perceived Sexual Orientation and Evaluations, we used the multilevel mediation approach described by Bauer et al. (2006). The analysis revealed a significant indirect effect of fluency, as the 95 % confidence interval did not include zero [−0.30, −0.05]. Thus, as expected, disfluent processing helped to explain why targets who were categorized as bisexual received negative evaluations following several seconds of visual exposure to their faces.

One question that arises from the above analysis is whether the association between disfluency and negative evaluations of targets categorized as bisexual holds even when perceivers are not explicitly asked to categorize sexual orientation. That is, in a more ecologically valid context in which perceivers form first impressions without being forced to categorize others in terms of their sexual orientation, do similar effects emerge? Because the order of judgments was counterbalanced in our study, we were able to test this possibility by replicating the above analyses among a subset of participants who completed evaluations first, before they provided explicit categorizations or gender ratings ($n = 24$). As before, we began by regressing Evaluations onto Perceived Sexual Orientation. Targets eventually categorized as bisexual were evaluated more negatively than targets not categorized as bisexual, $B = -2.23$, $SE = 0.54$, $z = -4.18$, $p < .001$. Next, we regressed Fluency onto Perceived Sexual Orientation. Targets eventually categorized as bisexual took longer to process than did targets not categorized as bisexual, $B = 270.67$, $SE = 79.25$, $z = 3.42$, $p < .001$. We also regressed Evaluations onto Fluency. Targets that were later processed disfluently were evaluated more negatively than targets that were later processed fluently, although this finding did not reach traditional significance levels, perhaps due to low power, $B = -0.0003$, $SE = 0.0002$, $z = -1.40$, $p = .163$. Finally, to test whether Fluency statistically accounted for the association between Perceived Sexual Orientation and Evaluations even when evaluations occurred prior to explicit categorization, we used the multilevel mediation approach described by Bauer et al. (2006). The analysis revealed a significant indirect effect of fluency, as the 95 % confidence interval did not include zero [−0.38, −0.01]. Thus, the effects described above were not an artifact of the cases in which perceivers categorized sexual orientation first and then provided evaluations. Instead, targets who were ultimately categorized as bisexual received negative evaluations even when those evaluations were made prior to explicit categorizations.

Another question left unanswered by our initial analysis is whether the fluency measure necessarily needs to incorporate the latency of both sexual orientation and gender typicality judgments. Although prior work combined both reaction times to account for the fact that sexual orientation and gender atypicality are closely related to one another (Lick and Johnson 2013), analyses that separate the two response latencies could help to pinpoint the origins of the fluency effect. Thus, we re-computed the mediation model described above testing reaction times for sexual orientation and gender judgments separately. The indirect

effect in the first mediation model (isolating the latency of sexual orientation judgments) was not significant, as the 95 % confidence interval included zero [−0.12, 0.07]. The indirect effect in the second mediation model (isolating the latency of gender judgments) was significant, as the 95 % confidence interval did not include zero [−0.21, −0.01]. Thus, it appears that the disfluent processing of gendered information in particular drives negative evaluations of targets believed to be bisexual. This finding is not surprising, given theoretical arguments that gender is among the most basic cues guiding social evaluation (Williams 1984) and recent empirical work highlighting gender atypicality as a primary factor driving negative evaluations of sexual minorities (Lick and Johnson 2014).

A final question is whether our findings were restricted to targets who were believed to be bisexual, or whether similar effects emerge for targets who personally identified as bisexual. To address this question, we re-computed our original analyses using targets' reported sexual orientations instead of perceived sexual orientations. We began by regressing Evaluations onto Reported Sexual Orientation. Bisexual targets were evaluated more negatively than were non-bisexual targets, $B = -3.66$, $SE = 0.30$, $z = -12.30$, $p < .001$ (Fig. 1b). Next, we regressed Fluency onto Reported Sexual Orientation. Bisexual targets took longer to process than did non-bisexual targets, $B = 213.56$, $SE = 44.70$, $z = 4.78$, $p < .001$. We also regressed Evaluations onto Fluency. As before, targets who were processed disfluently tended to be evaluated more negatively than targets who were processed fluently, $B = -0.001$, $SE = 0.0001$, $z = -3.87$, $p < .001$. Finally, to test whether Fluency statistically accounted for the association between Reported Sexual Orientation and Evaluations, we used the multilevel mediation approach described by Bauer et al. (2006). The analysis revealed a significant indirect effect of fluency, as the 95 % confidence interval did not include zero [−0.29, −0.07]. Thus, fluency's power to explain negative social evaluations extends beyond targets who are believed to be bisexual to targets who personally identify as bisexual.

Discussion

Bisexual individuals make up a sizable and growing community, with recent estimates indicating that between 0.7 and 3.1 % of the U.S. population openly identifies as bisexual (Gates 2011). Still, data about perceptions of bisexuality remain scarce. The current study provided three important insights related to this topic. First, we found that perceivers were sensitive to nonverbal cues of bisexuality in human faces. Although the absolute level of sensitivity ($M_{d'} = 0.17$) was lower than the sensitivity observed in previous work on monosexual orientations (often in the 0.30–0.40 range; Freeman et al. 2010; Lick et al. 2013; for a recent review, see Tskhay and Rule 2013), it was still significantly greater than zero. Thus, while perceivers may be less sensitive to facial cues to bisexual identities relative to lesbian/gay identities, the accuracy of their perceptions remains significantly above chance. These findings diverge somewhat from the only other published study on this topic, which documented chance levels of accuracy in bisexual categorization (Ding and Rule 2012). Both studies used the same stimuli, so we suspect that the contradiction arose due to other methodological differences. For example, Ding and Rule (2012) employed a trichotomous categorization task (*gay, straight, bisexual*) and continuous ratings of sexual orientation, whereas we employed a dichotomous categorization task (*not bisexual, bisexual*) with binary ratings of sexual orientation. Thus, these two studies reveal slightly different information about bisexual categorizations: Ding and Rule found that

perceivers could not accurately differentiate bisexual from lesbian/gay faces, whereas we found that perceivers could differentiate more generally between bisexual and non-bisexual faces. As such, the current findings provide the first evidence that perceivers are at least somewhat sensitive to facial cues that distinguish bisexual from monosexual individuals.

Second, our study begins to document the phenotypic cues associated with bisexual categorizations. In line with population base rates (Gates 2011), we found that women were more likely to be categorized as bisexual than were men. This suggests that perceivers are conscious of identity-related base rates when making decisions about bisexual orientations. Moreover, consistent with previous work testing the determinants of lesbian/gay categorizations, we found that facial gender atypicality was strongly related to bisexual categorizations. These findings align with those of Ding and Rule (2012), who reported that perceivers were unable to reliably distinguish between lesbian/gay and bisexual targets but that both groups were distinct from straight targets. Our study suggests that one reason for this result is that similar facial features—namely, gender atypicality—are associated with both lesbian/gay and bisexual identities. That is, perceivers seem to rely on the same gender inversion heuristic to categorize unknown others as both lesbian/gay and bisexual.

Third, we uncovered previously undocumented associations between bisexual categorizations drawn from facial cues and prejudiced social evaluations. Defining prejudice on the basis of a series of explicit evaluations (warmth, positivity, liking, desire for friendship), we found that (1) perceivers labeled others as bisexual based upon their facial features, (2) perceivers expressed prejudice against targets categorized as bisexual after mere seconds of visual exposure, and (3) anti-bisexual prejudice was driven in part by disfluent processing in the early moments of social perception. In fact, the same associations emerged for targets' self-reported sexual orientation and perceived sexual orientation, suggesting a robust link between disfluency and anti-bisexual prejudice. The fact that anti-bisexual prejudice emerged on the basis of limited visual exposure is intriguing. Indeed, while previous research documented staggering rates of prejudice against bisexual people (Herek 2002), our work suggests that the foundation for this prejudice is laid relatively early in the perceptual process. In particular, it appears that disfluent processing of bisexual adults' gendered facial cues helps to explain prejudice expressed against them. This finding provides additional evidence for the central role that gender atypicality plays in evaluations of bisexual individuals. More broadly, it extends recent theories of perceptual fluency by demonstrating that difficult processing helps to account not only for prejudice against lesbian, gay, and biracial people, but also bisexual individuals.

Despite the fact that the results of this study confirmed our hypotheses, several limitations deserve mention. First, participants were almost exclusively straight, so we cannot be sure whether similar findings would obtain for lesbian/gay or bisexual perceivers. Two predictions seem reasonable. On the one hand, fluency is a relatively low-level phenomenon that affects judgments across many different domains, which suggests that sexual minorities themselves may fall prey to the biasing effect of disfluency on evaluations of bisexual individuals. On the other hand, sexual minorities might have more exposure to gender-atypical features than do heterosexual individuals, which might make these features easier to process and subsequently eliminate the fluency effects observed here. These possibilities present intriguing avenues for future research that can test the stability of the link between fluency and anti-bisexual prejudice across various perceiver groups.

Although our study was the first to pinpoint gender atypicality as a nonverbal cue associated with bisexual categorizations, we did not set out to provide an exhaustive analysis of phenotypic cues to bisexuality. Thus, many other visible characteristics could guide bisexual categorizations, and additional research is required to explore these characteristics in detail. For example, it remains unclear whether gendered bodily cues (e.g., gender-atypical gait patterns; Johnson et al. 2007; Lick et al. 2013) or facial symmetry (Hughes and Bremme 2011) guide bisexual categorizations in the same way that they guide monosexual categorizations. Future work on this topic could help to clarify the phenotypic cues that give rise to consequential bisexual categorizations.

Because our studies did not experimentally manipulate fluency, it remains possible that fluency is not the most proximal factor associated with negative evaluations of bisexual individuals. Indeed, both disfluent processing and negative evaluations could be associated with some other variable (e.g., lack of familiarity) that captures a majority of the variance in negative evaluations of bisexual individuals. This possibility is even more likely given that the reverse-causal mediation model (perceived sexual orientation mediating the association between fluency and evaluations) was significant in our dataset (95 % CI [−0.21, −0.01]). Future studies could use other measures or manipulations of fluency to test the causal directionality of this effect and rule out potential confounding variables.

Finally, we should note that fluent processing might have been driven by many different factors in our study, including visual characteristics (e.g., gender atypicality) and semantic characteristics (e.g., the rarity of the bisexual label itself). Although previous scholars united various aspects of fluency under a common theory (Alter and Oppenheimer 2009), it may be useful for future researchers to tease apart the contributions of fluency's various sources. Doing so would help to clarify the variables that promote disfluent processing in the first place, which will be crucial for our understanding of the metacognitive underpinnings of sexual prejudice.

These limitations notwithstanding, the current findings provide novel information about perceptions of bisexuality and extend previous work linking perceptual fluency to prejudice. On the basis of this evidence, fluency appears to be a generalizable mechanism by which interpersonal biases emerge in the early stages of social perception. Armed with this knowledge, researchers might now begin to formulate interventions aimed at increasing the fluency of bisexual and other categorizations with the hope of reducing the prejudice bisexual individuals experience.

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