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Cross-sex theory of mind in the domain of sexual violence: upset, fear, and perceived likelihood

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ABSTRACT

An evolutionary perspective on theory of mind (ToM) leads us to hypothesize that inferences about others' beliefs, desires, and emotions are somewhat domain specific. In domains in which women and men have recurrently confronted different adaptive problems, selection should favor sex-differentiated ToM design features. One such domain centers on sexual violence; men have been the primary perpetrators and women the primary victims over time and across cultures. Using a mixed-subjects design ($N = 781$; 39% men), we tested two preregistered competing evolutionary hypotheses of sex-differentiated ToM inferences. The *byproduct hypothesis* posits that mind-reading errors occur because individuals use their own sexual psychology as a reference point, leading to an egocentric bias when inferring emotional reactions in the other sex. The *adaptation hypothesis* posits selection has favored adaptive inferential biases, analogous to men's oversexualization bias, that function to minimize more costly errors even if they result in more frequent low-cost errors. These biases could function to facilitate some sexual strategies. Underestimating victims' upset from sexual assault, for example, could facilitate a sexually exploitative strategy. We tested several predictions from both the *byproduct hypothesis* and the *adaptation hypothesis* across dimensions of cross-sex inference—upset, fear, and perceived likelihood of sexual victimization in a sample collected from social media and a public university in the southern United States. Men, on average, statistically underperceived women's self-reported upset following intimate partner sexual assault (Cohen's $d = 0.48$). Women, on average, statistically overperceived men's self-reported upset (Cohen's $d = 0.64$). In contrast, men and women were relatively accurate in predicting the opposite sex's fear of sexual violence. Men accurately inferred women's perceived likelihood of sexual victimization; whereas women statistically overestimated men's perceived likelihood of victimization (Cohen's $d = 0.69$). We tested individual differences theoretically relevant to the *adaptation hypothesis*. Discussion focuses on evidence bearing on adaptation and byproduct hypotheses.

> "As long as it's inevitable, you might as well lie back and enjoy it."
> - Clayton Williams, a Texas politician, comparing rape to bad weather, March 1990[1]

On a rainy day in March of 1990, gubernatorial candidate Clayton Williams compared rape to bad weather, joking that if rape is inevitable the victims should "lie back and enjoy it" (Texas Candidate's Comment about Rape Causes a Furor, 1990). His comment may have revealed a profound failure of cross-sex mind-reading, in this case dramatically underestimating the degree to which women experience sexual violence as extremely emotionally upsetting.

Clayton Williams' egregious false comparison may reflect predictable biases when inferring mental states of others. An early study documented male university students also significantly underestimated how emotionally upsetting female university students rated sexually aggressive acts (Buss, 1989). These inferential biases of others' perceptions, beliefs, and desires (henceforth "mind-reading"), may be an output of cognitive adaptations particularly in domains characterized by

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[1] Texas Candidate's Comment about Rape Causes a Furor (1990).

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sex-differentiated adaptive problems – such as sexual violence. The current study replicated Buss (1989) and tests two hypotheses regarding potential design features of a domain specific theory of mind: the *adaptive inferential bias hypothesis* and the *byproduct hypothesis*. We examined contextual factors including participant sex, inferential target sex, and individual differences theoretically related to sexual violence perpetration and victimization.

1. Sexual violence as a sexually differentiated selective pressure

1.1. Relevant definitions

Sexual violence is a large umbrella term inclusive of unwanted sexual behaviors characterized by "…coercion, harassment, or advances made by any person regardless of their relationship to the victim, in any setting, including but not limited to home and work" (Sen et al., 2002). Sexual violence therefore encompasses many behaviors differing in socially and reproductively relevant costs, including—but not limited to—receiving unsolicited sexual images, stalking, sexual coercion, sexual assault, and rape (e.g., Bates, 2017; Filice et al., 2022; Marcotte et al., 2021; Types of Sexual Violence | RAINN, 2026).

Due to the heterogeneity of behaviors included in the umbrella term of sexual violence and our focus on circumvention of sexual choice, we limit our discussion of sexual violence to sexual coercion, sexual assault, and rape. *Sexual coercion* involves "any physical sexual contact performed without a person's consent using any coercive methods (e.g., using a position of authority or verbal pressure)" (Lalumiere et al., 2005, p. 10). *Sexual assault*—defined by the Rape, Abuse and Incest National Network—includes "any sexual contact or behavior that happens without clear, voluntary, and informed consent" (Coursey, 2025). Sexual assault includes attempted rape, forcing sexual acts such as penetration or oral sex, penetrating a victim without consent, and coercing or manipulating victims into sex through the threat of force, lies, or guilt (Coursey, 2025). Rape, defined by the FBI's Uniform Crime Reporting Program, includes "penetration, no matter how slight, of the vagina or anus with any body part or object, or oral penetration by a sex organ of another person, without the consent of the victim" (Rape, 2017). We recognize the need for nuanced discussion; however, there exists no universal consensus on the boundaries of behaviors deemed sexual assault. Definitions, behavioral classifications, and perceptions of sexual coercion, sexual assault, and rape vary across studies, contexts, and time (e.g., Betterly et al., 2023; Fedina et al., 2018; Jaffe et al., 2022). We therefore use the terms provided by the empirical studies we review, and we use the term *sexual assault* to describe the suite of coercive or forceful behaviors functioning to circumvent the victims' mate choice – including with whom, where, and when sexual acts are performed.

1.2. Prevalence and costs of sexual violence

Although sexual assault is costly for both men and women, much data suggest women report greater prevalence rates and impacts following victimization. One study summarizing the 2016/2017 wave of the National Intimate Partner and Sexual Violence Survey reported data from 15,152 American women and 12,419 American men (Basile et al., 2022). Basile et al. (2022) estimated 1 in 4 American women (26.8%) reported attempted or completed rape victimization at some point in her life. This was in stark contrast to 1 in 26 American men (3.8%; ibid.). Considering another form of sexual victimization, an estimated 1 in 9 American men (10.7%) reported being made to penetrate someone in his lifetime (ibid.).

The sexually differentiated nature of sexual assault is also reflected in the sex of perpetrators. In Basile et al. (2022), 94% of female victims reported rape perpetrated by a man in their lifetime – 97.7% of rape occurring in the previous year were also perpetrated by men. Men represented the greatest share of male victims' perpetrators. Over 76% of male victims reported their perpetrators as male across their lifetime, whereas 71.9% of male victims reported male perpetrators for rapes occurring the past year (ibid.).

Men, but not women, experience a unique form of sexual assault: *made-to-penetrate*. Male victims forced to penetrate another person experience "made-to-penetrate" sexual assault (ibid.). This form of non-consensual sexual behavior is more likely perpetrated by women (69.6% lifetime; 83.8% prior year; ibid.).

Further adding to the sexually differentiated experience of sexual assault, immediate impacts following sexual assault also differed between women and men. Similar percentages of female and male victims reported sexually transmitted infections following rape. Roughly 16% of female rape victims reported contracting a sexually transmitted infection, compared to 18.2% of men reporting both rape and made-to-penetrate (Basile et al., 2022). Roughly 67.2% of female victims reported concern for their safety compared to 59.3% of male victims reporting both rape and made-to-penetrate (ibid.). Sixty-five percent of female victims reported they were fearful compared to 53.6% of male victims (ibid.). Women (37%) reported greater frequency of injuries compared to men (25.7%; ibid.).

Research on men's trauma following sexual violence is still in its infancy. Descriptive studies suggest both female and male rape victims experience negative mental health outcomes including anxiety, depression, and post-traumatic stress (Thomas & Kopel, 2023). A meta-analysis of childhood and adolescent sexual abuse victims suggested that, compared to male victims, female victims were significantly more likely to develop a depressive (42% vs. 12%, respectively) or anxiety (27% vs. 8%, respectively) disorder (Amado et al., 2015). One multisite study across eight American universities documented that (a) gender and sexual minority students and (b) cisgendered heterosexual female students were more likely to experience post-traumatic stress and more severe depression following sexual assault compared to cisgendered heterosexual male student victims (Kammer-Kerwick et al., 2021).

In species where females bare the greater obligate investment in offspring, sexual assault[2] imposed a unique adaptive problem on ancestral females: pregnancy (Parker, 1979; Trivers, 1972; for review see Buss, 2021; Lalumiere et al., 2005; Thornhill & Palmer, 2000). About 15% of female American rape victims reported pregnancy following a rape in the 2016/2017 wave of the National Intimate Partner and Sexual Violence Survey (Basile et al., 2022). Gottschall and Gottschall (2003) documented a possible increased likelihood of conception following rape compared to consensual sexual interactions.[3] Beyond the physiological injuries, psychological outcomes, and social impacts experienced by victims of sexual assault (Buss, 2021; Lalumiere et al., 2005; Mgoqi-Mbalo et al., 2017; Perilloux et al., 2012; Thornhill & Palmer, 2000), the sexually-differentiated adaptive problem of pregnancy for ancestral women—but not ancestral men—likely selected for a sexually differentiated psychology in the domain of sexual violence.

1.2.1. Sexually differentiated psychology surrounding sexual violence

These costs were likely large enough to result in sexually differentiated suites of adaptations producing emotions, preferences, and behaviors in this domain. Examples include women's specialized fear of stranger rape (e.g., Ferraro, 1996; Warr, 1984), preferences for formidable and dominant partners (e.g., Ryder et al., 2016), and cultivation of social allies as protection (Buss, 2021; Hahnel-Peeters, 2023, 2025; Wilson & Mesnick, 1997). Where data exist, men seem to lack—or rely

[2] "Forced copulation" in biology literature (e.g., Arnqvist & Rowe, 2005; Thornhill & Palmer, 2000).

[3] Identifying the true conception risk following each rape compared to each instance of consensual sexual behavior is an incredibly complex task. Since many rapes go unreported and pregnancies typically indicate greater likelihood of seeking medical assistance, rapes resulting in pregnancy are possibly more likely to be reported. See, e.g., Fessler (2003) for a thorough analysis of this topic.

less on—the same emotions, preferences, and behaviors displayed by women (Buss, 2021; Choi et al., 2020; Ferraro, 1996; Hahnel-Peeters, 2025).

2. Cross-sex theory of mind and sexual violence

If male-typical and female-typical minds differ in clear and consistent ways due to the sexually differentiated nature of sexual violence, understanding cross-sex mind-reading becomes especially important. Cross-sex mind-reading is an ability rooted in theory of mind.[4] If a man uses his own intuitions about how emotionally upset someone would be if an opposite-sex individual demanding sexual relations, he might make reasonable inferences about how other men would react. He might underestimate how emotionally upset a woman would be assuming he lacks an analogous fear of sexual assault to that held by women – an error in cross-sex mind-reading.

3. Errors in cross-sex mind-reading – the domain of sexual violence

There exists one study documenting cross-sex mind-reading surrounding sexual assault to our knowledge. Reviewed above, Buss (1989) documented that both sexes err while inferring the opposite sex's upset following sexually aggressive acts perpetrated by their intimate partner. The rated acts ranged from touching one's body without permission to forcing unwanted sex acts (ibid.). Male participants tended to underestimate women's upset following male-perpetrated intimate partner sexual aggression. The male participants accurately perceived cross-sex sexual aggression was more upsetting to women compared to men. They were insufficiently calibrated compared to female participants' actual self-reported upset following male-perpetrated intimate partner sexual aggression (ibid.). Conversely, women also recognized that men would be *less* upset by cross-sex sexual aggression compared to other women. Women also appeared to be insufficiently calibrated, however, because they overestimated men's upset following female-perpetrated intimate partner sexual aggression.

The current study explored in greater depth and breadth cross-sex mind-reading in the domain of sexual violence. We describe cross-sex mind-reading across three possible outputs of the hypothesized theory of mind system—upset following cross-sex sexual assault perpetrated by one's intimate partner, the perceived likelihood of sexual victimization, and fear of sexual violence. We tested two separate hypotheses informed by an adaptationist perspective on theory of mind and cross-sex mind-reading: an *adaptive inferential bias* and a *byproduct* hypothesis. We assumed a null hypothesis that natural selection favored an *adaptively accurate* theory of mind. Should natural selection favor an adaptively accurate theory of mind, errors in estimates would be minimal (see preregistered predictions).

4. Adaptive inferential biases hypothesis

The adaptive inferential biases hypothesis posits that selection has favored *adaptive inferential biases* in cross-sex mind-reading within domains characterized by sex-differentiated costs, such as sexual violence. These biases are analogous to men's oversexualization bias and women's under commitment bias (Haselton & Buss, 2000). Where a cost-asymmetry in perceptual errors exist, the perceptual error leading to the least-costly mistake is selected (Delton et al., 2013; Haselton et al., 2015; Haselton & Buss, 2000). Although both men and women may possess design features indicative of adaptive inferential biases to either facilitate or avoid sexual violence, we only had strong predictions for men's adaptive inferential biases.

4.1. The role of individual differences

Individual differences provide an important role in differentiating between the competing hypotheses about adaptive inferential bias versus non-adaptive byproduct. One important individual difference includes the context of participant sex. We review logic underlying men's perceptual errors in the average women's upset following, perceived likelihood of victimization, and fear of sexual assault separately from women's perceptual errors of the average man.

Predicting Men's Errors in Cross-Sex Mind-Reading. The *adaptive bias hypothesis* leads to a specific prediction: Men who pursue a sexually coercive strategy would be most likely to underestimate women's degree of fear and psychological upset in response to intimate partner sexual aggression – compared to men who do not pursue a sexually coercive strategy. Severely underperceiving women's psychological upset, likelihood of sexual victimization, and fear of sexual violence may further facilitate coercive sexual strategies by (1) circumventing empathy for victims and (2) downregulating the perceived cost of sexual aggression towards the victim in men following an exploitative sexual strategy in the context of a long-term relationship.

Individual differences in psychopathy, narcissism, and Machiavellianism (i.e., Dark Triad; Paulhus & Williams, 2002) may facilitate men's coercive sexual strategies (Jonason et al., 2009; Lewis et al., 2012). Men high in Dark Triad traits report greater rape-enabling attitudes (Jonason et al., 2009), and those pursuing short-term mating strategies perceive women as more sexually exploitable (Lewis et al., 2012). One survey study reported a positive correlation between men's self-reported frequency of sexual intimate partner violence and dark triad traits (r = 0.21) – but not men's self-reported empathic concern, aggressive traits, or emotional regulation (Cascardi et al., 2025). If these traits and mating orientations facilitate an underestimation of victims' emotional distress, they may reduce empathic responses, facilitating sexual assault. Such errors could reflect a psychological adaptation rather than a byproduct of self-referential inferences – or an ego-centric bias.

If errors in cross-sex mind-reading in the domain of sexual violence result from men's hypothesized adaptive inferential bias, we predicted men who implement a coercive sexual strategy would more severely underestimate women's (1) psychological upset following intimate partner sexual assault, (2) likelihood of sexual victimization, and (3) fear of sexual violence compared to men who implement a sexual strategy characterized by honest courtship.

Predicting Women's Errors in Cross-Sex Mind-Reading. If women's cross-sex mind-reading errors function to aid avoidance of future aggression, individual differences in age, mate value, fear of rape, and physical formidability may predict the magnitude of these errors. We explored the correlates of these individual differences as they are reliably linked to greater odds of sexual victimization (reviewed in Buss, 2021; Lalumiere et al., 2005; Thornhill & Palmer, 2000). We did not have strong predictions associated with women's cross-sex mind-reading errors, but we review literature below supporting our directed exploration.

Age. A woman's age predicts her likelihood of sexual victimization. Women between the ages of 16 and 24 are overrepresented compared to other age groups as victims of attempted and completed rape or sexual assault victimization (e.g., Morgan, 2020; Morgan & Oudekerk, 2019; Thornhill & Wilmsen Thornhill, 1983). Because unwanted or untimely pregnancies from sexual assault victimization are a cost paid only by ancestral women of reproductive-age (Coleman, 2015; Gottschall & Gottschall, 2003; Tao et al., 2023), post-menopausal women may be more accurate in their perceptions of men's reported psychological upset, likelihood of victimization, and fear of rape compared to reproductive-aged women.

Perceived Mate Value. Sexual perpetrators may specifically target

[4] Theory of mind is the cognitive ability to infer the mental states of others, such as their beliefs, thoughts, emotions, and desires, and to understand that these mental states may differ from those of one's own mind (Baron-Cohen, 2001; Leslie et al., 2004; Premack & Woodruff, 1978).

more physically attractive women (Beauregard et al., 2007; Goodwill et al., 2014). One cost of sexual assault includes decreased mate value (Perilloux et al., 2012). Women's self-perceived attractiveness positively predicts women's fear of rape and rape avoidance behaviors (McDonald et al., 2015, 2021; McKibbin et al., 2011) – possibly tracking greater evolutionarily relevant costs of sexual assault for women with higher mate values compared to women with lower mate values. If women's mate value calibrates the frequency of rape avoidance behaviors, mate value may also calibrate women's hypothesized adaptive biases functioning to avoid sexual violence. Women with higher self-perceived mate value, then, may significantly overestimate men's likelihood of sexual victimization to a greater extent compared to women with lower self-perceived mate value.

Fear of Sexual Violence. Women's fear of rape has been hypothesized to track the likelihood of sexual victimization – including age, mate value, and formidability (e.g., McDonald et al., 2019; Warr, 1984). Women of reproductive age report higher levels of rape fear compared to women outside of reproductive age (Ferraro, 1996; Warr, 1984). Women's fear of rape tracks environmental cues indicative of increased likelihood of sexual victimization. For example, *inclivity* measures visible signs of community disorder (e.g., vacant buildings and lots, abandoned cars, trash;LaGrange et al., 1992; Taylor et al., 1985). Rates of inclivity are strongly, positively correlated with perceived likelihood of victimization and individuals' reported fear of crime (LaGrange et al., 1992; Taylor et al., 1985). If women's fear of rape tracks the likelihood of sexual victimization, women reporting greater fear of rape may overestimate men's reported (1) fear of rape and (2) likelihood of sexual victimization to a greater magnitude compared to women reporting less fear of rape.

5. Byproduct hypothesis

Another hypothesis relevant to selection's effect on cross-sex mind-reading states that selection did *not* favor inferential errors. Biases may occur because individuals erroneously use their own desires and emotions as defaults—an egocentric bias—when generating inferences about the other sex. According to the byproduct hypothesis, these would be non-adaptive "bugs" rather than adaptive "design features." The role of individual differences is imperative for teasing apart the adaptive *inferential bias hypothesis* and the following *byproduct hypotheses*. Although not ruling out the *byproduct hypothesis*, individual differences systematically predicting the magnitude of perceptual error above and beyond participants' own ratings of each subdomain would provide proof of concept for the *adaptive inferential bias hypothesis.*

6. Method

All data, code, and materials are available on OSF.io (https://osf.io/as48w/?view_only=9271291b203d428aa0d592276970571f).

6.1. Participants

We preregistered an a priori power analysis for the most complex anticipated model (i.e., a 2 (Mind-Reading Target: opposite-sex; same-sex) X 2 [Participant Sex: Male; Female] X 15(Upset factor) ANCOVA with 5 covariates) assuming a medium effect, 80% power, and an alpha set at 0.05. G*Power (Faul et al., 2007; Faul et al., 2009) calculated a minimum sample size of 449 participants. We assumed a medium effect size due to the consistent medium to large sex differences found in the literature on self-perceptions of sexual victimization likelihood and fear of sexual violence (e.g., Bailey, 2022; Ferraro, 1996; Fetchenhauer & Buunk, 2005; Hilinski, 2009; Madan & Nalla, 2016).

We collected 1381 participants and removed 612 participants due to pre-registered inclusion criteria. Participants were removed from analyses for the following reasons: reporting they were younger than 18 years old (n = 152); spending less than 7.5 minutes on the study (n = 132), failing ReCAPTCHA (n = 120), and reporting less than 70% attention (n = 140) and honesty (n = 56). Participants were collected from either social media (e.g., Twitter, n = 320) or the participant pool at The University of Texas at Austin (n = 461).

A total of 781 participants (61% female, n = 476) were included in final data analyses. Participants were between 18 and 67 years old (Median = 20, M = 23.70, SD = 7.70). Our participants identified as White (47.2%; n = 369), Hispanic (20.7%; n = 162), Asian (17.3%; n = 135), Multi-ethnic (5.25%; n = 41), Black or African American (4.74%; n = 37), American Indian or Alaskan Native (2.82%; n = 22), "Other" (1.15%; n = 9), and Native Hawaiian or Pacific Islander (0.77%; n = 6). Our participants' sexual orientations were mainly heterosexual (79%; n = 617) followed by bisexual (10.9%; n = 85), homosexual (4.74%; n = 37), pansexual (1.41%; n = 11), asexual (1.15%; n = 9), and "other" (0.77%; n = 6). Sixteen participants did not report their sexuality. Our participants were single (51.7%, n = 404), in committed relationships (37.3%, n = 291), or dating (10%, n = 78). Eight participants (1.02%) identified their relationship status as "other."

6.2. Measures

6.2.1. Dependent variables

Magnitude of Psychological Upset. Following Buss (1989), participants rated the magnitude of upset evoked by the 147 items nominated in Buss's (1989) Study 1. Three additional sources of upset were added to this instrument following Buss's (1989) study. Therefore, each participant rated how upsetting they expected each of 150 items to be for themselves, the average member of their same sex, and the average member of the opposite sex. Per Buss (1989, p. 741), the instructions read:

> "Below is a list of things that men [women] sometimes do that irritate, annoy, anger, or upset the women [men] they are involved with. We are interested in how irritating, annoying, and upsetting each act is. In other words, if a man [woman] performed the act, how much would it be likely to irritate, annoy, anger, and upset you [the average woman, the average man] that he [she] was involved with. Use this 7-point scale: a '7' means that the act would be *extremely irritating, annoying, or upsetting*; a '1' means that the act would be *only slightly irritating, annoying, or upsetting*; a '4' means that the act would be *moderately irritating, annoying, or upsetting*. Use intermediate numbers for intermediate judgments. *If the act would not be irritating, annoying, or upsetting at all, select '0'.*"

A confirmatory factor analysis indicated the same 15-factor solution documented in Buss (1989; See Tables S1A-C for item loadings), $\chi^2(1953) = 5203.87$, $p < .001$, RMSEA = 0.05, 90%CI RMSEA[0.049, 0.052], CFI = 0.757. The domains of upset rated by participants included acts described as condescending; possessive, jealous, or dependent; neglecting, rejecting, or unreliable; abusive; unfaithful; inconsiderate; self-absorbed with their physical appearance; moody; sexually withholding; sexualizing others; abusing alcohol and being emotionally guarded; having a disheveled appearance; insulting their partners' appearance; selfishness/self-centered; and sexual assault (*sexual aggression* factor in Buss, 1989). Table 1 displays Cohen's α for composite reliabilities across inference targets: self, average woman, and average man.

Because the main domain of interest was individuals' upset to sexual assault, we discuss only that domain below. The factor encompassing sexual aggressiveness was a composite of the following items: (1) a man/woman they were involved with used them for sexual purposes, (2) a man/woman they were involved with tried to force sex acts on them, (3) a man/woman they were involved with demanded sexual relations, and (4) a man/woman they were involved with forced them to have sex. Greater values indicate greater levels of reported upset. Other notable comparisons were included in the supplemental materials.

Fear of Sexual Violence. We measured fear of sexual violence using

Table 1
Cohen's α for upset composites across inference targets.

Composite	Inference Target		
	Self	Average Man	Average Woman
Condescending	0.80	0.80	0.91
Possessive – Jealous – Dependent	0.76	0.83	0.84
Neglecting – Rejecting – Unreliable	0.68	0.74	0.79
Abusive	0.59	0.85	0.86
Unfaithful	0.66	0.65	0.89
Inconsiderate	0.65	0.65	0.73
Self-Absorbed with Physical Appearance	0.73	0.65	0.82
Moody	0.58	0.65	0.70
Sexually Withholding	0.69	0.70	0.79
Sexualized Others	0.55	0.49	0.64
Abuse Alcohol – Emotionally Guarded	0.67	0.69	0.77
Disheveled Appearance	0.68	0.70	0.85
Insulted Appearance	0.59	0.66	0.65
Sexual Assault	0.86	0.86	0.86
Self-Centered	0.60	0.73	0.79

Note. Table displays standardized Cohen's α for each composite following a confirmatory factor analysis based on Buss (1989).

a modified methodology described in Hilinski (2009). Fear of crime was measured across four specific crimes (i.e., theft, robbery, physical assault, and rape) at night. Participants self-reported their fear of crime using a 7-point scale (1-*Not Fearful At All* to 10-*Extremely Fearful*). Participants rated their fear of crime (α = 0.90), the average woman's fear of crime (α = 0.86), and the average man's fear of crime (α = 0.90). We analyzed both the fear of crime composite score and fear of sexual assault individually.

Likelihood of Victimization. We measured participants' perceived likelihood of being criminally victimized. Participants reported their perceived likelihood of being targeted for five specific crimes on a 7-point scale (1- *Extremely Unlikely* to 7-*Extremely Likely*). The five crimes were sexual assault, sexual harassment, robbery, murder, and identity theft. Participants also rated their perceived likelihood of being targeted for crime in general. Participants rated their perceived likelihood of victimization (α = 0.90), the average woman's likelihood of victimization (α = 0.90), and the average man's likelihood of victimization (α = 0.90).

6.2.2. Individual difference measures

Demographics. Participants responded to demographic information including age, biological sex, ethnicity, relationship status, and sexual orientation.

Sociosexual Orientation Inventory. Participants responded to the sociosexual orientation inventory-revised (Penke & Asendorpf, 2008), a 9-item inventory measuring participants' willingness to engage in short-term sexual relationships (α = 0.88). The inventory consists of three subscales measuring sexual behaviors (α = 0.87), attitudes (α = 0.69), and desires (α = 0.87).

Dark Triad. To measure participants' darker personality traits, we used the short dark triad scale (Jones & Paulhus, 2014). This is a 27-item scale with nine items measuring three separate traits: Machiavellianism (α = 0.79), Narcissism (α = 0.65), and Psychopathy (α = 0.76).

Toronto Empathy Questionnaire. We measured participants' general empathy levels using the Toronto Empathy Questionnaire (α = 0.87; Spreng et al., 2009). The Toronto Empathy Questionnaire contains 16 statements measuring a participant's trait-level empathy (e.g., "I find that I'm 'in tune' with other people's moods." and "When someone else is feeling excited, I tend to get excited too.") Participants responded on a 0 – *Never* to 4 – *Always* Likert-type scale. Upon reverse-coding appropriate items, participant responses were summed to create an empathy composite.

Mate Value. We used a simple, four-item measure of self-perceived mate value by Edlund and Sagarin (2014; α = 0.90). Participants responded with a seven-point Likert-type scale: 1 (*Extremely Undesirable*) to 7 (*Extremely Desirable*). The items include: "Overall, how would you rate your level of desirability as a partner on the following scale?" "Overall, how would members of the opposite sex rate your level of desirability on the following scale?" "Overall, how do you believe you compare to other people in desirability as a partner on the following scale?" and "Overall, how good of a catch are you?" We averaged together the four items to form a composite of self-perceived mate value. Higher numbers represent greater self-perceived mate value.

Perceived Formidability. We measured participants' perceived formidability using the same method as Kerry and Murray (2018, 2021). Participants rated their physical strength compared to their peers on a 1–100 scale. They also rated their ability to fight compared to their peers on a 1–100 scale. The anchor of 1 signified weaker/lower fighting ability and 100 signified stronger/greater fighting ability. We scaled the two ratings before averaging them together as a perceived formidability composite (α = 0.87).

6.3. Procedure

Participants followed the study's advertisement link to Qualtrics. They provided informed consent for a study advertised as "Gendered Mind-Reading: What does each gender think upsets the other?" In random order, participants rated the magnitude of upset for each of the 150 items, fear of crime, and perceived likelihood of victimization. They rated each of these variables for every combination of the target factor (i.e., self, average woman, average man). The condition target and order of items were randomized to mitigate order effects. Next, participants responded to randomized individual difference measures listed above. This study was approved by the institution's ethics board (STUDY00004132).

6.4. Analysis plan

6.4.1. Degree of cross-sex mind-reading errors

We ran three separate repeated measures ANOVAs separately predicting the outcome variables (i.e., upset following intimate partner sexual aggression, fear, and perceived likelihood of victimization) from the interaction between participants' biological sex and target of perception. Pairwise comparisons were Bonferroni adjusted for four planned comparisons: Women's self-ratings compared to men's ratings of the average woman, women's self-ratings compared to women's ratings of the average woman, men's self-ratings compared to women's ratings of the average man, and men's self-ratings compared to men's ratings of the average man. The Bonferroni adjusted alpha level for significant comparisons was $\alpha = 0.0125$.

6.4.2. Role of individual differences

To test predictions that differentiated hypotheses about adaptive inferential biases versus byproducts, we computed cross-sex error scores for each participant. These scores were computed by subtracting the mean of the opposite sex's self-ratings from each participants' ratings of the average member of the opposite sex. For example, men's perceptual errors of women's upset following sexual assault were calculated by subtracting 6.11 (i.e., mean of women's self-rated upset) from each male participants' composite score of the average woman's upset following sexual assault. In all instances, positive scores indicated an *over*-perception of the average member of the opposite sex and negative scores indicated an *under*-perception of the average member of the opposite sex. A score of 0 indicated accurate perception of the average member of the opposite sex's upset, likelihood, and fear.

Men's Individual Differences. To understand the role of men's individual differences in the magnitude of men's misperceptions of women's (1) upset following intimate partner sexual assault, (2) perceived likelihood of sexual victimization, and (3) fear of rape, we ran

three multiple linear regression models. The regression models predicted the magnitude of misperceptions from the following variables: Men's self-ratings of the outcome variable; age; empathy levels; Machiavellianism; psychopathy; narcissism; sociosexual orientation; and two-way interactions between sociosexual orientation and Machiavellianism, sociosexual orientation and psychopathy, and sociosexual orientation and narcissism.

Women's Individual Differences. To understand the role of women's individual differences in the magnitude of women's misperceptions of men's (1) upset following intimate partner sexual assault, (2) perceived likelihood of sexual victimization, and (3) fear of rape, we ran three multiple linear regression models. The regression models predicted the magnitude of misperceptions from the following variables: Self-ratings in magnitude of upset, fear, or perceived likelihood where appropriate; participants' age; perceived mate value; fear of rape; perceived formidability; and a two-way interaction between perceived mate value and perceived formidability.

6.4.3. Sensitivity analyses

In response to reviewer feedback, we reanalyzed our data excluding non-heterosexual participants (n = 617). We ran these analyses to ensure our observed effects were not driven by differences in sexual orientation.

7. Results

See Table 2 for outcome variable means as a function of participant sex and rating target, Table 3 for correlations among all variables of interest, and supplemental materials for same-sex theory of mind comparisons.

7.1. Men's adaptive inferential biases

The 2 [Participant Sex: Male, Female] X 3 (Target Condition: Self, Average Man, Average Woman) repeated measures ANOVA predicting errors in upset following sexual aggression indicated a statistical interaction between participants' biological sex and the target condition, F (1.83, 1314.85) = 111.27, $p < .001$, $\eta_p^2 = 0.055$, followed by a simple main effect for male participants, $F(2, 890) = 103.21$, $p < .001$, $\eta_p^2 = 0.188$ (Table 4). Supporting predictions, pairwise comparisons indicated that men (M = 5.43; SD = 1.60) statistically *under*perceived women's upset following sexual assault (M = 6.11; SD = 1.20), $t(754) = 6.67$, $p_{adj} < 0.001$, mean difference = 0.68, 95%CI mean difference[0.48, 0.88], Cohen's d = 0.48 (Fig. 1).

The 2 [Participant Sex: Male, Female] X 3 (Target Condition: Self, Average Man, Average Woman) repeated measures ANOVA predicting

Table 2
Means (SE) of DVs as a function of target and participant sex.

Rating Domain	Perceptual Target	Participant Sex	
		Male	Female
Upset	Self	3.63 (0.11)	6.11 (0.06)
	Average Man	3.63 (0.11)	4.78 (0.08)
	Average Woman	5.43 (0.09)	6.05 (0.06)
Fear	Self	3.24 (0.14)	6.07 (0.07)
	Average Man	3.22 (0.13)	3.44 (0.10)
	Average Woman	6.28 (0.06)	6.52 (0.05)
Likelihood	Self	2.55 (0.10)	4.59 (0.10)
	Average Man	3.20 (0.10)	3.79 (0.08)
	Average Woman	4.74 (0.11)	5.73 (0.08)

Note. Table displays the average ratings of each outcome variable (i.e., rating domain) as a function of participant sex and rating target. Upset represents participants' ratings of upset following sexual assault perpetrated by their partner on a 0–7 scale. Fear represents participants' ratings of fear of rape on a 1–7 scale. Likelihood represents participants' ratings of perceived likelihood of sexual victimization on a 1–7 scale.

Table 3
Correlations for variables of interest.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Age	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2. Mate Value	0.07	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3. SOI	0.71**	0.19	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
4. Perc Formid.	0.64**	0.36	0.69**	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5. Machiev.	0.22	0.12	0.51*	0.50*	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
6. Narcissism	0.15	0.63**	0.40	0.62**	0.56**	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7. Psychopathy	0.50*	0.15	0.80**	0.77**	0.78**	0.60**	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
8. Empathy	0.07	0.43*	0.34	0.38	0.51*	0.51*	0.50*	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–
9. Self: Upset	−0.80**	−0.20	−0.85**	−0.89**	−0.58**	−0.52*	−0.82**	−0.30	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–
10. Avg W Upset	−0.61**	−0.19	−0.70**	−0.83**	−0.63**	−0.59**	−0.86**	−0.39	0.85**	1.00	–	–	–	–	–	–	–	–	–	–	–	–
11. Avg M Upset	−0.65**	−0.21	−0.70**	−0.60**	−0.43*	−0.40	−0.57**	−0.22	0.77**	0.65**	1.00	–	–	–	–	–	–	–	–	–	–	–
12. M Err: W Upset	−0.61**	−0.19	−0.70**	−0.83**	−0.63**	−0.59**	−0.86**	−0.39	0.85**	1.00**	0.65**	1.00	–	–	–	–	–	–	–	–	–	–
13. W Err: M Upset	−0.65**	−0.21	−0.70**	−0.60**	−0.43*	−0.40	−0.57**	−0.22	0.77**	0.65**	1.00**	0.65**	1.00	–	–	–	–	–	–	–	–	–
14. Self: Fear	−0.58**	−0.10	−0.52*	−0.36	0.03	−0.10	−0.23	0.04	0.41	0.13	0.35	0.13	0.35	1.00	–	–	–	–	–	–	–	–
15. Avg W Fear	−0.51*	−0.06	−0.43*	−0.30	−0.00	−0.08	−0.25	0.02	0.31	0.24	0.28	0.24	0.28	0.79**	1.00	–	–	–	–	–	–	–
16. Avg M Fear	0.22	0.03	0.20	0.49*	0.44*	0.25	0.48*	0.25	−0.46*	−0.58**	−0.16	−0.58**	−0.16	0.45*	0.32	1.00	–	–	–	–	–	–
17. M Err: W Fear	−0.51*	−0.06	−0.43*	−0.30	−0.00	−0.08	−0.25	0.02	0.31	0.24	0.28	0.24	0.28	0.79**	1.00**	0.32	1.00	–	–	–	–	–
18. W Err: M Fear	0.22	0.03	0.20	0.49*	0.44*	0.25	0.48*	0.25	−0.46*	−0.58**	−0.16	−0.58**	−0.16	0.45*	0.32	1.00**	0.32	1.00	–	–	–	–
19. Self: Likelihood	−0.59**	−0.20	−0.40	−0.61**	−0.23	−0.27	−0.36	−0.11	0.53**	0.29	0.15	0.29	0.15	0.42*	0.25	−0.32	0.25	−0.32	1.00	–	–	–
20. Avg W Likely	−0.64**	−0.26	−0.48*	−0.67**	−0.31	−0.35	−0.49*	−0.21	0.58**	0.43*	0.21	0.43*	0.21	0.35	0.30	−0.41	0.30	−0.41	0.89**	1.00	–	–
21. Avg M Likely	−0.33	−0.28	−0.22	−0.18	0.01	−0.10	−0.04	−0.03	0.12	−0.07	0.05	−0.07	0.05	0.40	0.23	0.26	0.23	0.26	0.40	0.40	1.00	–
22. M Err: W Likely	−0.64**	−0.26	−0.48*	−0.67**	−0.31	−0.35	−0.49*	−0.21	0.58**	0.43*	0.21	0.43*	0.21	0.35	0.30	−0.41	0.30	−0.41	0.89**	1.00**	0.40	1.00
23. W Err: M Likely	−0.33	−0.28	−0.22	−0.18	0.01	−0.10	−0.04	−0.03	0.12	−0.07	0.05	−0.07	0.05	0.40	0.23	0.26	0.23	0.26	0.40	0.40	1.00**	0.40

Note. Table indicates Pearson correlations using pairwise complete observations. SOI is the sociosexual orientation inventory composite. Upset indicates the composite score for participants' ratings of upset following sexual aggression perpetrated by one's intimate partner. * indicates $p < .05$. ** indicates $p < .01$.

Table 4
Repeated measures ANOVAs predicting upset, perceived likelihood of victimization, and fear of rape.

Outcome Measure	Predictor	DF_{Num}	DF_{dom}	SS_{Num}	SS_{Dom}	*F*	*p*-value	η_p^2
Upset Following IPSA	(Intercept)	1	718	4985.87	3299.52	10,848.57	<0.001	0.904
	BioSex	1	718	1066.38	3299.52	232.05	<0.001	0.167
	Target	1.83	1314.85	814.62	2002.23	292.122	<0.001	0.133
	BioSex X Target	1.83	1314.85	310.28	2002.23	111.27	<0.001	0.055
Perceived Likelihood of Sexual Assault	(Intercept)	1	774	37,371.78	3763.46	7685.96	<0.001	0.820
	BioSex	1	774	812.35	3763.46	167.07	<0.001	0.090
	Target	1.75	1355.43	1441.97	4442.06	251.25	<0.001	0.149
	BioSex X Target	1.75	1355.43	208.02	4442.06	36.25	<0.001	0.025
Fear of Rape	(Intercept)	1	733	51,145.78	3769.40	10,488.45	<0.001	0.881
	BioSex	1	773	682.17	3769.40	139.89	<0.001	0.090
	Target	1.85	1426.76	3242.46	3126.11	801,771	<0.001	0.320
	BioSex X Target	1.85	1426.76	787.64	3126.11	194.76	<0.001	0.103

Note. Table displays focal repeated measures ANOVAs. BioSex contrasts include 0 = Male; 1 = Female. Target contrasts include 1 = Self; 2 = Average Woman; 3 = Average Man. IPSA = intimate partner sexual aggression.

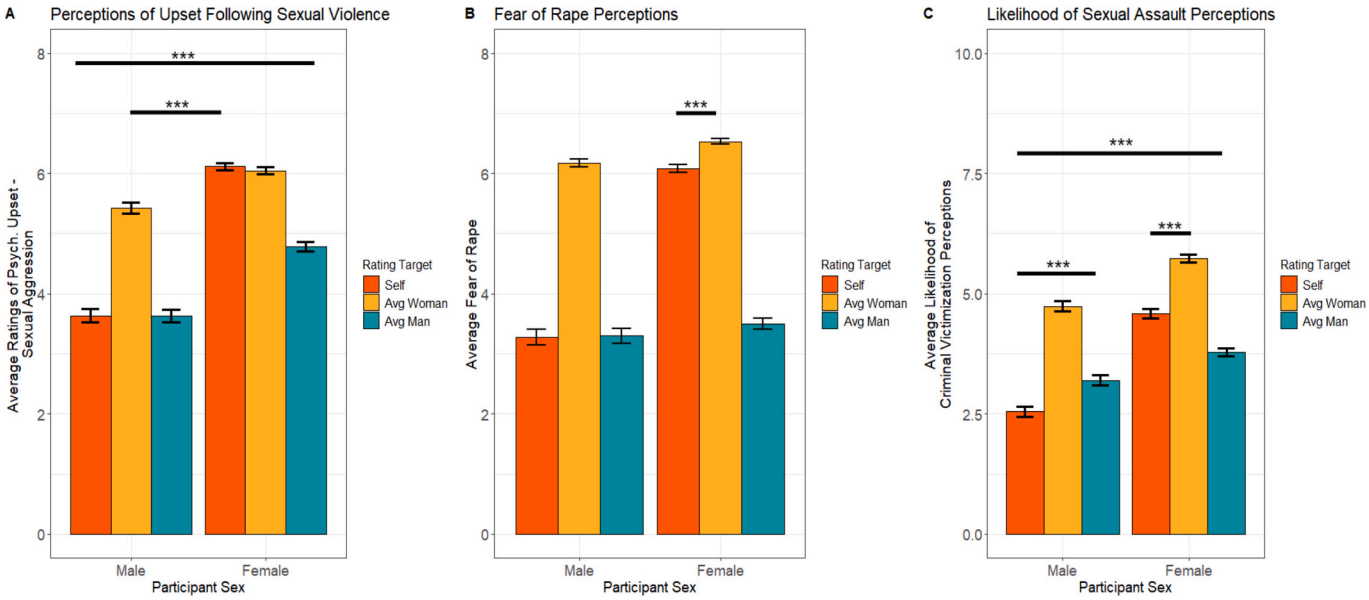

Fig. 1. Figure displays mean differences between men and women's perceptions of rating targets' (A) upset following intimate partner sexual assault, (B) fear of rape, and (C) perceived likelihood of sexual victimization. (A) Men statistically underestimated the average women's upset following intimate partner sexual aggression, whereas women statistically overestimated the average man's upset following intimate partner sexual aggression. (B) Women statistically overperceived other women's fear of rape. No cross-sex mind-reading errors were reported in women's/men's fear of rape. (C) Women statistically overperceived the average man's perceived likelihood of sexual victimization. Both men and women overestimated the average member of the same sex's perceived likelihood of sexual victimization. Both upset and fear of rape were measured on a 7-point Likert-type scale. The likelihood of sexual victimization was measured on a 10-point Likert-type scale. *** $ps_{adj} < 0.001$.

errors in perceived likelihood of sexual victimization indicated a statistical interaction between participants' biological sex and target condition, $F(1.75, 1355.43) = 36.25$, $p < .001$, $\eta_p^2 = 0.025$, followed by a simple main effect for male participants, $F(2, 911) = 112.95$, $p_{adj} < 0.001$, $\eta_p^2 = 0.199$ (Table 4). Pairwise comparisons indicated that men ($M = 4.47$; $SD = 1.94$) accurately estimated the average woman's perceived likelihood of sexual victimization ($M = 4.59$; $SD = 2.11$), $t(778) = 1.00$, $p_{adj} > 0.90$ (Fig. 1).

The 2 [Participant Sex: Male, Female] X 3 (Target Condition: Self, Average Man, Average Woman) repeated measures ANOVA predicting errors in fear of rape indicated a statistical interaction between participants' biological sex and target condition, $F(1.85, 1426.76) = 194.76$, $p < .001$, $\eta_p^2 = 0.103$, followed by a simple main effect of target condition for male participants, $F(2, 910) = 232.97$, $p < .001$, $\eta_p^2 = 0.338$ (Table 2). Pairwise comparisons indicated that men (M = 6.17; SD = 1.14) accurately estimated the average woman's fear of rape (M = 6.08; SD = 1.51), $t(775)$ 0.88, $p_{adj} > 0.99$ (Fig. 1).

7.1.1. Role of men's individual differences

Men's individual differences accounted for 32% of the variance in cross-sex mind-reading errors of women's upset following sexual aggression, $F(10, 240) = 11.13$, $p < .001$, $R^2 = 0.32$ (Table 5). Men's self-ratings of upset statistically predicted the magnitude of cross-sex mind-reading errors, $\beta = 0.45$, $t(240) = 8.06$, $p < .001$. All other coefficients were not statistically significant, $ps = 0.06–0.99$ (Fig. S1).

Men's individual differences accounted for 15% of the variance in cross-sex mind-reading errors of women's perceived likelihood of sexual victimization, $F(10, 260) = 4.55$, $p < .001$, $R^2 = 0.15$ (Table 5). Men's cross-sex mind-reading errors were predicted by self-perceived likelihood of sexual victimization, $\beta = 0.33$, $t(260) = 5.22$, $p < .001$, men's age, $\beta = -0.16$, $t(260) = -2.53$, $p = .01$, and men's psychopathy, $\beta = -0.27$, $t(260) = -3.36$, $p < .001$, other coefficients were not statistically

Table 5
Multiple regression model predicting men's misperceptions of women's upset, victimization likelihood, and fear of rape.

Outcome Variable	Coefficient	β (*SE*)	t-value
Upset Following IPSA	(Intercept)	0.00 (0.06)	−0.01
	Self-Ratings	0.45 (0.06)	8.06***
Model Fit:	Age	−0.06 (0.06)	−0.94
$F(10, 240) = 11.13$,			
$p < .001$	Empathy	0.08 (0.06)	1.33
$R^2 = 0.32$	Machiavellianism	0.01 (0.06)	1.72
	Psychopathy	0.12 (0.07)	1.72+
	Narcissism	0.12 (0.06)	1.91+
	SOI	−0.03 (0.06)	−0.48
	Machiavellianism X SOI	0.04 (0.06)	0.68
	Psychopathy X SOI	−0.02 (0.06)	−0.31
	Narcissism X SOI	−0.03 (0.07)	−0.43
Likelihood of Victimization	(Intercept)	0.00 (0.06)	−0.07
	Self-Ratings	0.33 (0.06)	5.22***
Model Fit:	Age	−0.16 (0.06)	−2.53*
$F(10, 260) = 4.55$			
$p < .001$	Empathy	0.06 (0.07)	0.94
$R^2 = 0.15$	Machiavellianism	0.03 (0.07)	0.44
	Psychopathy	−0.27 (0.08)	−3.36***
	Narcissism	−0.02 (0.07)	−0.34
	SOI	0.11 (0.07)	1.63
	Machiavellianism X SOI	−0.04 (0.07)	−0.59
	Psychopathy X SOI	0.09 (0.07)	1.29
	Narcissism X SOI	−0.04 (0.07)	−0.56
Fear of Rape	(Intercept)	0.07 (0.06)	1.47
	Self-Ratings	0.19 (0.06)	3.40***
Model Fit:	Age	−0.11 (0.06)	−1.85+
$F(10, 260) = 4.82$			
$p < .001$	Empathy	0.07 (0.06)	1.13
$R^2 = 0.16$	Machiavellianism	0.24 (0.07)	3.63***
	Psychopathy	−0.25 (0.07)	−3.46***
	Narcissism	0.02 (0.06)	0.25
	SOI	0.12 (0.06)	1.82+
	Machiavellianism X SOI	−0.10 (0.06)	−1.55
	Psychopathy X SOI	0.04 (0.06)	0.59
	Narcissism X SOI	−0.10 (0.07)	−1.45

Note. Self-ratings indicate men's own ratings of how upset they would be in response to their romantic partner's sexual aggression, their perceived likelihood of sexual victimization, or their own fear of rape. 95%CI represents 95% confident intervals for standardized beta coefficients. IPSA = intimate partner sexual aggression + $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

significant, *ps* > 0.10 (Fig. S2).

Men's individual differences accounted for 16% of the variance in cross-sex mind-reading errors of women's fear of sexual victimization, $F(10, 260) = 4.82$, $p < .001$, $R^2 = 0.16$ (Table 5). Men's errors in cross-sex mind-reading of women's fear of sexual victimization were statistically predicted by men's own fear of sexual victimization, $\beta = 0.19$, $t(260) = 3.40$, $p < .001$, men's Machiavellianism, $\beta = 0.24$, $t(260) = 3.63$, $p < .001$, and men's psychopathy, $\beta = -0.24$, $t(260) = -3.46$, $p < .001$. All other coefficients were not statistically significant, *ps* > 0.066 (Fig. S3).

7.2. Women's hypothesized adaptive inferential biases

The 2 [Participant Sex: Male, Female] X 3 (Target Condition: Self, Average Man, Average Woman) repeated measures ANOVA predicting errors in upset following sexual aggression indicated a statistical interaction between participants' biological sex and the target condition, $F(1.83, 1314.85) = 111.27$, $p < .001$, $\eta_p^2 = 0.055$, followed by a simple main effect for female participants, $F(2, 1382) = 129.40$, $p < .001$, $\eta_p^2 = 0.158$ (Table 4). Supporting our predictions, pairwise comparisons indicated that women ($M = 4.78$; $SD = 1.73$) statistically *over*perceived men's upset following sexual assault ($M = 3.63$; $SD = 1.84$), $t(755) = 8.67$, $p_{adj} < 0.001$, mean difference = 1.15, 95%CI mean difference [0.89, 1.41], Cohen's $d = 0.64$. (Fig. 1).

The 2 [Participant Sex: Male, Female] X 3 (Target Condition: Self, Average Man, Average Woman) repeated measures ANOVA predicting errors in perceived likelihood of sexual victimization indicated a statistical interaction between participants' biological sex and target condition, $F(1.75, 1355.43) = 36.25$, $p < .001$, $\eta_p^2 = 0.025$, followed by a simple main effect for female participants, $F(2, 1421) = 124.67$, $p_{adj} < 0.001$, $\eta_p^2 = 0.149$ (Table 4). Supporting our predictions, pairwise comparisons indicated that women ($M = 3.79$; $SD = 1.82$) *over*estimated the average man's perceived likelihood of sexual victimization ($M = 2.55$; $SD = 1.80$), mean difference = 1.24, 95%CI mean difference[0.98, 1.50], $t(778) = 9.33$, $p_{adj} < 0.001$, Cohen's $d = 0.69$ (Fig. 1).

The 2 [Participant Sex: Male, Female] X 3 (Target Condition: Self, Average Man, Average Woman) repeated measures ANOVA predicting errors in fear of rape indicated a statistical interaction between participants' biological sex and the rating condition, $F(1.83, 1314.85) = 111.27$, $p < .001$, $\eta_p^2 = 0.055$, followed by a simple main effect for female participants, $F(2, 1421) = 496.86$, $p < .001$, $\eta_p^2 = 0.412$ (Table 6). Pairwise comparisons indicated that women ($M = 3.50$; $SD = 2.11$) accurately estimated the average man's fear of rape ($M = 3.28$; $SD = 2.20$), $t(778) = 1.40$, $p_{adj} = 0.64$ (Fig. 1).

7.2.1. Role of women's individual differences

Women's individual differences explained 16% of the variance in cross-sex mind-reading errors of men's upset following sexual aggression, $F(6, 427) = 13.58$, $p < .001$, $R^2 = 0.16$ (Table 6). Women's self-ratings of upset following sexual aggression was the only individual difference measure that predicted the magnitude of error in men's psychological upset, $\beta = 0.39$, $t(427) = 7.53$, $p < .001$, Fig. S4. All other predictors were not statistically significant, *ps* > 0.27.

Women's individual differences accounted for 8% of the variance in cross-sex mind-reading errors of men's perceived likelihood of sexual victimization, $F(6, 453) = 6.83$, $p < .001$, $R^2 = 0.08$ (Table 4). Women's self-perceived likelihood of sexual victimization ($\beta = -0.15$, $t(453) = -3.09$, $p = .002$), age ($\beta = 0.10$, $t(453) = -1.99$, $p = .047$), fear of rape ($\beta = 0.20$, $t(453) = 4.21$, $p < .001$), and perceived formidability ($\beta = 0.17$, $t(453) = 3.44$, $p < .001$) statistically predicted the magnitude in cross-sex mind-reading errors in likelihood of sexual victimization (Fig. S5).

Women's individual differences accounted for 27% of the variance in cross-sex mind-reading errors of men's fear of sexual assault, $F(5, 456) = 33.41$, $p < .001$, $R^2 = 0.27$ (Table 6). Women's own fear of rape ($\beta = 0.32$, $t(456) = 7.73$, $p < .001$), age ($\beta = 0.19$, $t(456) = 4.29$, $p < .001$), and perceived formidability ($\beta = 0.37$, $t(456) = 8.49$, $p < .001$) predicted the magnitude of error in estimates of men's fear of rape (Fig. S6).

7.3. Sensitivity analyses

Focal analyses on overall errors in mind-reading were robust to the exclusion of non-heterosexual participants. Only one pairwise comparison was statistically different when excluding non-heterosexual participants. When including non-heterosexual women, participants were accurate in reporting men's estimated fear of rape. When excluding non-heterosexual women, heterosexual women slightly overestimated men's fear of rape ($t = 2.74$, *padj* = 0.038, Cohen's $d = 0.22$; see supplemental materials). There were largely similar patterns in the multiple regression models, with self-ratings remaining the strongest predictor across all

Table 6
Multiple regression model predicting women's misperception of men's upset, victimization likelihood, and fear of rape.

Outcome Variable	Coefficient	β (SE)	t-value
Upset Following IPSA	(Intercept)	0.00 (0.04)	0.04
	Self-Ratings	0.39 (0.05)	7.53***
Model Fit:			
$F(6, 427) = 13.58$	Age	−0.05 (0.05)	−0.99
$p < .001$			
$R^2 = 0.16$	Perceived Mate Value	−0.02 (0.05)	−0.37
	Fear of Rape	0.03 (0.05)	0.68
	Perceived Formidability	0.06 (0.05)	1.10
	Perceived Mate Value X Perceived Formidability	−0.04 (0.04)	−0.88
Likelihood of Sexual Victimization	(Intercept)	0.02 (0.05)	0.33
	Self-Ratings (Likelihood)	−0.15 (0.05)	−3.09**
Model Fit:	Age	−0.10 (0.05)	−1.99*
$F(6, 453) = 6.83$			
$p < .001$	Mate Value	0.01 (0.05)	0.21
$R^2 = 0.08$			
	Fear of Rape	0.20 (0.05)	4.21***
	Perceived Formidability	0.17 (0.05)	3.44***
	Fear of Rape X Perceived Formidability	0.01 (0.05)	0.30
Fear of Rape	(Intercept)	0.00 (0.04)	0.06
	Self-Ratings (Fear of Rape)	0.32 (0.04)	7.73***
Model Fit:	Age	0.19 (0.04)	4.29***
$F(5, 456) = 33.41$			
$p < .001$	Mate Value	−0.08 (0.04)	−1.82+
$R^2 = 0.27$			
	Perceived Formidability	0.37 (0.04)	8.49***
	Mate Value X Perceived Formidability	−0.00 (0.04)	−0.11

Note. Self-ratings indicate women's own ratings of how upset they would be in response to their romantic partner sexually assaulting them, their perceived likelihood of sexual victimization, or their own fear of rape. 95%CI represents 95% confident intervals for standardized beta coefficients. IPSA = intimate partner sexual aggression + $p < .10$; * $p < .05$, ** $p < .01$,*** $p < .001$.

outcomes. Some coefficients shifted in significance, and the explained variance changed in some models. Men's psychopathy and narcissism became significant predictors. Women's primary predictors (i.e., self-ratings, fear of rape, and perceived formidability) remained statistically significant, but age was dropped from likelihood estimates. Tables S4 and S5 display full regression outputs for a heterosexual only sample.

8. Discussion

Theory of mind (ToM) has been understood as domain general in terms of content and perceptual accuracy (e.g., Baron-Cohen, 2001; Henry et al., 2013; Premack & Woodruff, 1978; Rakoczy, 2022; Wellman et al., 2003). Evolutionary perspectives on ToM hypothesize a somewhat domain-specific ToM. One's accuracy of inferences about others' mental states is likely influenced by the content one must infer. Evolutionary perspectives on ToM also argue that cross-sex inferences in ToM may be systematically inaccurate in domains characterized by sexually differentiated selection pressures (e.g., sexual violence). We tested two evolutionarily informed hypotheses regarding the accuracy of cross-sex mind-reading in the domain of sexual violence: (1) the adaptive inferential biases hypothesis and (2) the byproduct hypothesis.

8.1. Men's cross-sex theory of mind

8.1.1. Upset following sexual aggression perpetrated by an intimate partner

Replicating Buss (1989), men statistically underestimated how upset women would be following sexual assault from a romantic partner, Cohen's $d = 0.48$. Men's perceptions of women's upset following intimate partner sexual assault ($M_{1989} = 5.80$; $M_{2023} = 5.43$) were statistically lower than women's reported upset ($M_{1989} = 6.47$; $M_{2023} = 6.05$). These effects spanned 34 years, suggesting men's estimated errors were robust to cultural changes and increased knowledge and awareness surrounding sexual assault in the United States (e.g., Taylor, 2006).

Individual differences moderating the magnitude of error in men's perceptions of women's upset following intimate partner sexual assault are key to teasing apart the *adaptive inferential bias hypothesis* and the *byproduct* hypothesis. Men's degree of error was only statistically accounted for by their *own* ratings of upset following sexual aggression. Men who scored higher on the dark triad and sociosexual orientation inventory and lower on empathy were no more likely to overestimate women's upset following intimate partner sexual assault compared to men low on the dark triad and sociosexual orientation inventory and high on empathy. This finding fails to support the adaptive bias hypothesis and points instead towards the *byproduct hypothesis*.

8.1.2. Likelihood of sexual victimization

Our data suggest men were relatively accurate in estimating women's perceived likelihood of sexual victimization. Men who scored higher on psychopathy were more likely to *under*perceive women's perceived likelihood of sexual victimization compared to men who scored lower on psychopathy. This aligns with the literature on dark triad traits facilitating sexual violence victimization (Jonason et al., 2009; Jonason et al., 2017; Lewis et al., 2012) and our *adaptive inference hypothesis*.

If men who score high in psychopathy perceive women to consider themselves less likely to be sexual victimized, this misperception could facilitate an aggressive sexual strategy within the contexts of romantic partnerships. For example, men who score high in psychopathy may assume a lower-base rate or stricter definition for sexual violence (Longpre et al., 2022; Lyons et al., 2015). These assumptions could influence a suspicious schema, leading men who score high in psychopathy to discount the veridicality of women's negative responses to sexual advances (Malamuth & Brown, 1994).

8.1.3. Fear of rape

Men were relatively accurate in perceptions of women's fear of rape. Individual differences beyond men's own fear were influential in the magnitude of error in men's perceptions of women's fear. Men with higher scores on psychopathy were more likely to *under*perceive women's fear of rape compared to men with lower scores on psychopathy, although this was a small effect. Men with higher scores on Machiavellianism were more likely to *over*perceive women's fear of rape compared to men with lower scores on Machiavellianism – opposite of our prediction. A potential explanation could include ceiling effects in women's fear of rape. Future research should use a larger, sliding scale assessing the fear of rape which would allow for more nuanced responses.

8.2. Women's cross-sex theory of mind

8.2.1. Upset following sexual aggression perpetrated by an intimate partner

Women statistically *over*perceived men's upset following partner-perpetrated sexual assault. The magnitude of error between women's perceptions of men and men's actual ratings of upset following intimate partner sexual aggression were statistically predicted only by women's own upset following partner-perpetrated sexual aggression – not their

age, perceived mate value, fear of rape, or perceived formidability. These results suggest greater support for the byproduct hypothesis compared to the adaptive inferential bias hypothesis for women's avoidance of sexual violence.

8.2.2. Likelihood of sexual victimization

Women *over*estimated men's perceived likelihood of sexual victimization, Cohen's $d = 0.69$. Individual differences predicted the magnitude in errors between women's perceptions of men's sexual victimization likelihood compared to the average man's self-reported likelihood. Women's own perceived sexual victimization likelihood positively predicted their magnitude of errors in perceiving men's reported likelihood.

The adaptive inferential bias hypothesis predicted that women's age, mate value, fear of rape, and perceived formidability were important individual differences teasing apart the hypothesis from the byproduct hypothesis. Women's mate value was not predictive of cross-sex mind-reading errors in men's perceived likelihood of sexual victimization. Our participants' age was not sufficiently widely distributed to compare post-menopausal women's and peri-menopausal women's cross-sex mind-reading. Visual inspection of scatterplots, however, suggested that older women were more likely to *under*estimate men's average reported likelihood of sexual victimization (Fig. S5). This was not aligned with the prediction of women's inferential adaptive bias hypothesis – that post-menopausal women would be more accurate in estimating men's perceived likelihood of sexual victimization. More data across a broader age-range of women are necessary to accurately test this prediction.

Women's fear of rape predicted women's cross-sex mind-reading errors of men's perceived likelihood of sexual victimization. We predicted that women who were more fearful of sexual violence and less physically formidable would be more likely to *over*perceive men's likelihood of sexual victimization. Women who were less fearful of rape slightly *under*estimated men's average perceived likelihood. Women who were more fearful were more accurate in estimating men's reported likelihood of sexual victimization. Women's perceived formidability also predicted cross-sex mind-reading errors of men's perceived likelihood of sexual victimization after controlling for women's self-perceived likelihood. All else equal, more formidable women *over*estimated men's perceived likelihood of sexual victimization. There was no statistical interaction between fear of rape and perceived formidability.

These results cannot rule out the byproduct hypothesis but may instead speak to the importance of fear motivating women seeking self-defense lessons to increase their formidability. Women who fear sexual assault are typically over-represented in self-defense classes targeting defenses against sexual violence (for review see Brecklin, 2008). Self-defense courses training women in assertiveness, self-efficacy, and physical competence in physical defenses have been demonstrated to decrease rape fear and increase perceived formidability and agency in self-defense (Hollander, 2018a; Hollander, 2018b; Hollander & Cunningham, 2020; Ullman, 2007). Future work should include one's history of self-defense classes as a covariate to account for potential confounds.

8.2.3. Fear of rape

Women accurately estimated men's fear of rape. Beyond women's own reported fear of rape, women's age and perceived formidability predicted the magnitude of errors in cross-sex mind-reading. Visual inspections of scatter plots for the effects of women's age on the magnitude of error for cross-sex mind-reading indicates potential floor effects. Due to the restricted range of women's age, this figure may not hold and should be interpreted with caution. Women's self-perceived formidability's relationship with errors in cross-sex mind-reading is more evident. Women who perceived themselves as more formidable compared to their peers were more likely to overperceive men's fear of sexual violence. This was opposite the prediction made by the adaptive inferential bias hypothesis. Future research should investigate at a more granular level the relationship between women's individual differences, their fear of rape, and cross-sex mind-reading errors in fear of rape.

8.3. Sensitivity analysis

To evaluate whether sexual orientation drove our findings, we conducted sensitivity analyses without the inclusion of non-heterosexual individuals ($n = 617$). Our overall findings, including the ANOVA effects and pairwise comparisons, were robust to this exclusion. Some regression coefficients shifted in significance and explained variance fluctuated (see Tables S4 and 5). These changes likely reflect reduced sample size and restricted variability, rather than substantial theoretical differences. Accordingly, individual differences should be interpreted with caution. Future research may include larger, more diverse samples to clarify the role of individual differences in cross-sex mind-reading errors within the domain of sexual violence.

8.4. Implications

Regardless of the cause for cross-sex mind-reading errors in sexual violence, men and women clearly differed on their perceptions of the average woman and average man regarding upset following sexual assault. Both sexes recognized that women report greater distress than men, however, men underestimated the magnitude of women's upset, and women overestimated the magnitude of men's upset. This miscalibration may have implications for interventions, education, and policy related to sexual violence.

Sexual education focusing on the severity of costs faced by women following sexual violence informed by an evolutionary perspective should address this apparent cross-sex bias. By educating men and women on their heuristic biases and misperceptions, increased knowledge and understanding may recalibrate some men's (1) likelihood to follow a sexually coercive mating strategy or (2) intervene in scenarios with escalating violence. Education about cross-sex mind-reading errors may recalibrate or align perceptions of what interpersonal experiences define sexual violence.

The misperception of the opposite sex's upset following sexual assault hold grave implications for prosecuting sexual violence. The current standard for prosecuting sexual violence includes the "reasonable person" standard (Buss, 2023; "Reasonable Person" — Judicial Education Center, 2026). The "reasonable person" standard deems behavior as sexually violent if the sexual behavior would induce fear in a "reasonable person." A "reasonable person" is defined as an individual of average intelligence without severe mental health problems ("Reasonable Person" — Judicial Education Center, 2026). Our data suggest that a reasonable man and a reasonable woman differ in the upset following sexual assault, and reasonable men and women may not accurately perceive the opposite sex's upset in this domain. Thus, the current standard may be inappropriate for prosecution of sexual violence; attribute to the low prosecution and conviction rates of sexual coercion, assault, and rape; and impose greater harm to victims.

9. Conclusion

We found mixed evidence for the inferential adaptive bias hypotheses and the byproduct hypotheses for cross-sex theory of mind within the domain of sexual violence – with greater support for the byproduct hypothesis. We replicated Buss's (1989) paper 34 years later, suggesting that men's misperceptions of women's upset following sexual assault was not solely a statistical artifact of cultural norms. Men were relatively accurate in estimating women's perceived likelihood of sexual violence and fear of sexual violence. Although specific individual differences accounted for individual errors in these perceptions, patterns did not systematically support the idea that misperceptions function to facilitate sexually coercive strategies.

Although our hypotheses were motivated by evolutionary logic, the present study cannot distinguish adaptations from byproducts of

adaptations. Our findings should be interpreted as preliminary evidence and proof of concept for domain specificity in theory of mind – rather than confirmation of functionally designed, domain-specific adaptations. Our data provide evidence for deeper focus on cross-sex mind-reading—particularly in domains characterized by sexually differentiated adaptive problems—but do not rule out alternative explanations. Alternative explanations regarding sex differences in empathy and Emotionality, for example, may explain cross-sex mind-reading without invoking specialized adaptive biases in the domain of sexual violence. Research on socio-affective and socio-cognitive processes such as empathy, compassion, and emotionality interact dynamically with theory of mind (e.g., Lee & Ashton, 2020; Preckel et al., 2018; Rochat, 2023), which could produce systematic miscalibrations through more domain general theory of mind mechanisms without requiring adaptively biased perceptions.

Taken together, our results suggested that men and women differ in how they approach cross-sex mind-reading, with women more likely to rely on ego-centric biases and men showing selective underestimation rather than a broadly adaptive patterns. Understanding these misperceptions has important implications for education, sexual violence prevention, and legal frameworks assessing intent and harm in cases of sexual violence.

CRediT authorship contribution statement

Rebecka K. Hahnel-Peeters: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **William Costello:** Writing – review & editing, Methodology, Conceptualization. **Paola Baca:** Methodology, Conceptualization. **David P. Schmitt:** Conceptualization. **David M. Buss:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.evolhumbehav.2026.106835.

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