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Original Article

Voice Pitch Influences Perceptions of Sexual Infidelity

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Abstract: Sexual infidelity can be costly to members of both the extra-pair and the paired couple. Thus, detecting infidelity risk is potentially adaptive if it aids in avoiding cuckoldry or loss of parental and relationship investment. Among men, testosterone is inversely related to voice pitch, relationship and offspring investment, and is positively related to the pursuit of short-term relationships, including extra-pair sex. Among women, estrogen is positively related to voice pitch, attractiveness, and the likelihood of extra-pair involvement. Although prior work has demonstrated a positive relationship between men's testosterone levels and infidelity, this study is the first to investigate attributions of infidelity as a function of sexual dimorphism in male and female voices. We found that men attributed high infidelity risk to feminized women's voices, but not significantly more often than did women. Women attributed high infidelity risk to masculinized men's voices at significantly higher rates than did men. These data suggest that voice pitch is used as an indicator of sexual strategy in addition to underlying mate value. The aforementioned attributions may be adaptive if they prevent cuckoldry and/or loss of parental and relationship investment via avoidance of partners who may be more likely to be unfaithful.

Keywords: Infidelity, voice pitch, masculinity, testosterone, attractiveness

Introduction

Sexual infidelity has associated fitness costs and benefits for both sexes. Males benefit from increased reproductive success by procreating with additional females, while females benefit by selectively reproducing with males that offer either greater indirect genetic benefits such as viable offspring (Gangestad and Thornhill, 1997; Symons, 1979), or greater direct benefits such as material resources (Gray, 1997; Greiling and Buss, 2000),

than do their current mates. Extra-pair copulations carry potential fitness costs to both men and women, such as the risk of exposure to sexually transmitted infections (Geary and Byrd-Craven, 2004). If discovered, extra-pair mates risk retaliation from the in-pair partner (Daly and Wilson, 1988), and risk resource loss via devaluation as a long-term mate (Alatalo, Gottlander, and Lundverg, 1987). Detecting the risk of partner infidelity is potentially adaptive, as sexual infidelity is inherently costly to the in-pair mate. Men are subject to a loss in fitness if they are cuckolded by their mate, while women risk loss of resource investment to the extra-pair female and any of her subsequent offspring (Anderson, Kaplan, and Lancaster, 1999, 2007).

Individuals may infer infidelity risk among males by assessing testosterone-dependent traits. Indeed, converging evidence indicates that sexual strategy varies with men's testosterone levels. Testosterone levels are inversely related to relationship investment (Gray, Campbell, Marlowe, Lipson, and Ellison, 2004; Booth and Dabbs, 1993; van Anders, Hamilton, and Watson, 2007) and parental investment (Gray, Parkin, and Samms-vaughan, 2007). Men with relatively high testosterone levels report sustained interest in sex beyond their current committed relationship (McIntyre et al., 2006), a greater number of sex partners (Peters, Rhodes, and Simmons, 2008), and a higher number of extra-marital affairs (Fisher et al., 2009).

Men's testosterone levels are associated with mating strategy, and specifically with sexual infidelity. Therefore, individuals may evaluate morphological markers of hormonal status in order to infer the probability of sexual infidelity. The development of a masculine, low-pitched voice is dependent upon pubertal testosterone levels (Hollien, 1960). Voice pitch (the perception of fundamental frequency and/or corresponding harmonics), is tied to the rate of vocal fold vibration, which is influenced by vocal fold size, length, and thickness (Titze, 1994). Thicker and longer vocal folds are capable of producing lower frequencies than are thinner vocal folds (Titze, 1994). In males, pubertal testosterone levels cause an increase in vocal fold length and thickness, leading to an adult male voice pitch that is on average half that of the average adult female voice pitch (Abitbol, Abitbol, and Abitbol, 1999; Harries, Hawkins, Hacking, and Hughes, 1998).

Voice pitch continues to be negatively correlated with testosterone levels into adulthood (Evans, Neave, Wakelin, and Hamilton, 2008; Dabbs and Mallinger, 1999). Testosterone can act as an immunosuppressant (Chen and Parker, 2004; Folstad and Karter, 1992; Wichmann, Ayala, and Chaudry, 1997), thus testosterone-dependent traits may serve as indicators of an immune system robust enough to withstand the adverse effects of testosterone (Feinberg, 2008; Fink and Penton-Voak, 2002; Folstad and Karter, 1992). Testosterone levels are also positively associated with dominant behavior and social status (Mazur and Booth, 1998). Therefore, vocal masculinity communicates heritable immunity to contagion and dominance, and thus mate quality.

Lower-pitched men's voices are not only rated as more attractive (Collins, 2000; Feinberg, DeBruine, Jones, and Little, 2008a; Feinberg, Jones, Little, Burt, and Perrett, 2005a; Saxton, Caryl, and Roberts, 2006; Vukovic et al., 2008), but are associated with a greater number of reported sexual partners (Puts, Gaulin, and Verdolini, 2006), and greater reproductive success (Apicella, Feinberg, and Marlowe, 2007) than are higher-pitched men's voices. Furthermore, men with attractive voices report more sex partners than do

men with less attractive voices (Hughes, Dispenza, and Gallup, 2004). There is also evidence that suggests men with low-pitched voices are more likely to commit infidelity; men with attractive voices report a higher number of extra-pair sex partners and are chosen by women as an extra-pair partner more often (Hughes et al., 2004). The above suggests that men with relatively high testosterone levels may present a greater infidelity risk to their partners, though it is unclear whether observers assess infidelity risk via vocal cues to underlying testosterone levels.

Estimating the likelihood of a woman committing sexual infidelity may also rely on the evaluation of physiological markers of hormonal status. While there is substantial evidence for a positive relationship between testosterone and sexuality among men, the relationship between women's sexuality and testosterone is more complex (for review see Bancroft, 2005; Baumeister, Cantanese, and Vohs, 2001). Increases in women's testosterone levels during the fertile phase of the menstrual cycle are associated with increased preferences for masculinity in men's faces (Welling et al., 2007). This may indicate increased infidelity risk due to women's desire to obtain heritable traits of immunocompetence and dominance for their offspring from men with higher testosterone, while maintaining parental and resource investment from their current mates (Welling et al., 2007). Additionally, increases in testosterone during the fertile menstrual cycle phase are positively related to intercourse frequency among couples (Morris, Udry, Khan-Dawood, and Dawood, 1987; Persky, Lief, Strauss, Miller, and O'Brien, 1978). Therefore, the relationship between cyclic variations in testosterone and sexuality may not solely reflect women's extra-pair interest.

Although there is a relationship between cyclic variations in testosterone and sexuality *within* women, the evidence for a positive relationship between trait levels of testosterone and sexuality *among* different women is equivocal (for review see Bancroft, 2005; Baumeister et al., 2001; Stuckey, 2008). Indeed, van Anders and Dunn (2009) found that among women, higher levels of sexual desire were related to higher trait levels of estrogen, but not to higher trait levels of testosterone.

While research suggests that women's trait levels of testosterone may be unrelated to infidelity risk, there is evidence to suggest that a feminine voice pitch is associated with increased infidelity risk. Among women, vocal femininity (i.e. relatively high voice pitch) is positively related to estrogen levels (Abitbol et al., 1999) and may indicate both fertility status and underlying reproductive capability (Bryant and Haselton, 2009; for review see Feinberg, 2008). Women with higher measured levels of estrogen report a greater number of long-term relationships, yet also report a greater likelihood of adulterous behaviors (Durante and Li, 2009). Men judge women with higher-pitched voices as more attractive (Collins and Missing, 2003; Feinberg, DeBruine, Jones, and Perrett, 2008b; Jones, Feinberg, DeBruine, Little, and Vukovic, 2008), more feminine (Feinberg et al., 2008b), younger (Collins and Missing, 2003; Feinberg et al., 2008b), and as more desirable marriage partners (Apicella and Feinberg, 2009) than they judge women with lower-pitched voices. Additionally, women with attractive voices report more sex partners, more extra-pair sex, and are chosen more often by paired men as extra-pair partners (Hughes et al., 2004).

Like vocal femininity, a feminine (i.e. lower) waist-to-hip ratio is an indicator of

estrogen levels (Jasienska, Ziomkiewicz, Ellison, Lipson, and Thune, 2004). Women with feminine waist-to-hip ratios are rated by men as relatively more attractive (Singh, 1993; Singh, Dixson, Jessop, Morgan, and Dixson, 2010), evoke jealousy from other women (Buunk and Dijkstra, 2005), score higher on assessments of sexual desire (van Anders and Hampson, 2005) and report more extra-pair sex than do women with less feminine waist-to-hip ratios (Hughes and Gallup, 2003). Women with feminine bodies also have more attractive voices than do women with less feminine bodies (Collins and Missing, 2003; Hughes et al., 2004). Estrogen-dependent traits among women are not only associated with adulterous behavior, but may influence the perception of infidelity risk as well. Men who perceive their partners as more attractive are more likely to engage in frequent and multiple anti-cuckoldry tactics, indicating that men perceive infidelity risk to be higher for partners that are more attractive (Kaighobadi and Shackelford, 2008). Therefore, women with attractive, feminine voices may be perceived as more likely to commit infidelity due to a greater opportunity for, or engagement in, extra-pair sex given their desirability as a mate.

Whether observers hold beliefs about the fidelity of potential mates based on vocal sexual dimorphism has yet to be investigated. Here we tested whether observers' attributions of sexual infidelity are influenced by manipulating the pitch of male and female voices. We predicted that men with relatively more masculine voices would be perceived as more likely to be unfaithful to their romantic partners than would men with relatively less masculine voices. We predicted that women with feminized voices would be perceived as more likely to cheat sexually on their partners than would women with masculinized voices.

It is potentially adaptive for individuals to be sensitive to cues of infidelity among potential mates due to the costs of infidelity to the in-pair partner (Anderson, Kaplan, and Lancaster, 1999, 2007); non-mates cannot inflict such costs. Therefore, we predict that pitch manipulations will influence attributions of infidelity to opposite sex but not same sex voices.

In order to determine if attributions of infidelity are related to voice pitch preferences, we also measured participants' attributions of attractiveness to male and female voices differing only in pitch. If participants' attributions of infidelity are determined by pitch preferences, than there will be a positive relationship between vocal masculinity preferences and attributions of infidelity.

Materials and Methods

Participants

Protocols for this study were approved by the McMaster University Research Ethics Board. Participants were 54 males (mean age = 18.31 years, *SD* = 0.95) and 61 females (mean age = 19.07 years, *SD* = 1.29), recruited from the McMaster University on-line subject pool and compensated with extra course credit for participation.

Participant age and sexual orientation were self-reported. We excluded participants indicating sexual orientation other than heterosexual (*n* = 7), and those that failed to indicate any sexual orientation (*n* = 4). This resulted in a final sample of 49 males (mean age = 18.29 years, *SD* = 0.91) and 55 females (mean age = 19.09 years, *SD* = 1.30).

Stimuli

Voice clips were collected and manipulated in the same manner as Feinberg et al., (2008a; 2008b; 2006, 2005a, 2005b). Participants aged 18-24 (9 women, 9 men) were recorded speaking the English monopthong vowels (International Phonetic Alphabet Symbols in parentheses); 'ah' as in father (a), 'ee' as in see (i), 'eh' as in bet (ɛ), 'oh' as in note (o), 'oo' as in boot (u). Single channel recordings were made in a quiet room with an Audio-Techica AT4041 microphone at a 44.1 kHz sampling rate, with 16-bit amplitude quantization in Sound Forge software (Sony Creative Software).

We created two versions of each recording, a feminized version with raised pitch, and a masculinized version with lowered pitch. Voice pitch was modified using the pitch-synchronous overlap add (PSOLA™ France Telecom) method in Praat software (Boersma and Weenink, 2009). The PSOLA method is a standard technique of voice manipulation as it selectively manipulates fundamental frequency, and related harmonics, while controlling for other spectrotemporal features of the signal (Feinberg et al., 2008b; Feinberg et al., 2005a, 2005b; Moulines and Charpentier, 1990).

Voice pitch was raised and lowered by adding or subtracting 0.5 equivalent rectangular bandwidths (ERBs) of the baseline frequency. The ERB scale accounts for the difference between pitch perception and natural frequencies more accurately than do alternative scales (Tranmüller, 1990). This manipulation is equivalent to an approximately 25 Hz manipulation at an average female voice pitch of 225 Hz, and a 20 Hz manipulation for an average male voice pitch of 120 Hz, while ensuring the degree of pitch manipulation is perceived equivalently regardless of the natural pitch of a given voice. See Table 1 for descriptive statistics of the vocal stimuli. This level of manipulation has been successful in previous research on voice pitch (Apicella and Feinberg, 2009; Feinberg et al., 2008b; Jones et al., 2008; Vukovic et al., 2008).

Table 1. Descriptive statistics of vocal stimuli.

	Sex of Voice			
Pitch Manipulation	Female		Male	
	Hz	ERB	Hz	ERB
Feminized	229.26	5.95	138.92	3.99
Masculinized	181.87	4.95	98.99	2.98

Procedure

Male and female voices were presented in separate randomized blocks. Within blocks, stimuli pairs were randomized for order and side of screen presentation. The infidelity and attractiveness blocks were randomized for order and were interspersed with both auditory and non-auditory distracter tasks. Stimuli pairs were masculine and feminine versions of the same identity, presented in a two-alternative forced choice paradigm. Voices were played consecutively, prompted by the participant selecting the 'play' button for the individual voice.

Following Feinberg et al. (2008b), we presented all participants with the same 4

voice pairs, and verbally instructed participants to choose which one, from each pair, was more likely to cheat sexually on their romantic partner. The question "which person do you think is more likely to cheat on their partner?" remained visible on-screen throughout the infidelity attribution block. In the attractiveness attribution block, we presented all participants with the same 6 voice pairs, and verbally instructed participants to choose which one, from each pair, was more attractive. The question "which is more attractive to you?" remained visible on-screen throughout the attractiveness attribution block.

Five of the voice pairs in the attractiveness attribution block were different from those voice pairs presented in the infidelity attribution block. The infidelity and attractiveness attribution blocks contained a different number of trials and different voice pairs in order to prevent participants from engaging in identity matching across tasks. Participants indicated their choice after listening to each voice pair, and could play voice clips multiple times (Feinberg et al., 2005a; Collins, 2000). Participant responses automatically loaded the next voice pair.

Results

We calculated the proportion of trials in which participants selected the masculinized versions of voice pairs as more likely to commit infidelity and as more attractive, separately. Shapiro-Wilk tests indicated significant deviation from normalcy for all variables (all $W > .851$, all $p < .005$); therefore, all analyses used non-parametric, two-tailed probability estimates. See Table 2 for descriptive statistics.

One-sample Wilcoxon signed-rank tests were used to determine if pitch manipulations influenced the proportion of trials that masculinized voices were selected as more likely to be unfaithful, against what would be expected by chance alone (0.5). Women chose masculinized (i.e. low-pitched) men's voices ($Z = 3.79$, $p < .001$) as more likely to be unfaithful on a significantly greater proportion of trials than they chose feminized (i.e. high-pitched) men's voices. There was no influence of pitch manipulation on women's attributions of infidelity to female voices ($Z = -.978$, $p = .328$).

Table 2. Mean (*SE*) proportion of trials raters chose masculinized stimuli.

Stimuli	Sex of Rater	
Female	Women	Men
Infidelity	0.46 (0.04)	0.40 (0.04)
Attractiveness	0.27 (0.03)	0.21 (0.03)
Male		
Infidelity	0.69 (0.04)	0.53 (0.05)
Attractiveness	0.66 (0.03)	0.57 (0.04)

Men chose feminized female voices as more likely to cheat on their partners more often than they chose masculinized female voices ($Z = -2.26$, $p = .024$). There was no effect of male voice pitch manipulation on men's attributions of infidelity ($Z = 0.50$, $p = .615$).

Both men ($Z = -5.88$, $p < .001$) and women ($Z = -5.49$, $p < .001$) selected feminized female voices as more attractive than masculinized female voices. Women participants

chose masculinized men's voices (Z = 3.65, p < .001) as more attractive than feminized men's voices, but male voice pitch manipulations did not influence men's attractiveness ratings (Z = 1.04, p = .301).

We used Mann-Whitney U tests to determine if there were sex differences in attributions of infidelity and attractiveness. Women chose masculinized male voices as more likely to commit infidelity on a significantly greater proportion of trials than did men (U = 956.00, Z = -2.62, p = .009). There was no significant difference between men's and women's attributions of infidelity to women's voices (U = 1214.00, Z = -0.90, p = .371). Furthermore, we did not find any significant sex differences in voice pitch preferences either male (U = 1120.50, Z = -1.50, p = .132) or female voices (U = 1133.00, Z = -1.44, p = .149).

We used Spearman's rank order correlations to determine the relationship between pitch preferences and attributions of infidelity. For male voices, there was no relationship between pitch preferences and attributions of infidelity among men (r = .111, p = .447, n = 49) or women participants (r = .148, p = .282, n = 55). Additionally, there was no relationship between preferences for female voice pitch and attributions of infidelity among men (r = -.061, p = .677, n = 49) or women (r = .222, p = .104, n = 55).

Repeating all analyses with parametric statistics yielded no qualitative differences from the aforementioned analyses.

Discussion

We hypothesized that masculinized men's voices and feminized women's voices would be perceived as more attractive and more likely to commit infidelity. We found that while women attributed infidelity to masculinized men's voices, men's attributions of infidelity were not related to male voice pitch manipulations. While men attributed infidelity to feminized women's voices, women did not. Thus, the results reported here cannot be due to a response bias to low- or high-pitched voices in general. Furthermore, there was no relationship between participants' preferences for voice pitch and their attributions of infidelity, suggesting that attributions of infidelity are not merely an artifact of preferences.

We found that women rated masculinized men's voices as more likely to commit infidelity than feminized men's voices. Considering that women rate lower-pitched men's voices as more attractive than higher-pitched men's voices, both here and in prior studies (Collins, 2000; Feinberg et al., 2005a; Feinberg et al., 2008a; Jones et al., 2008; Jones, Feinberg, DeBruine, Little, and Vukovic, 2010; Saxton et al., 2006; Vukovic et al., 2010), these findings are consistent with Hughes et al. (2004), who found that men with attractive voices report engaging in more extra-pair sex than do men with less attractive voices. Men's vocal masculinity serves as an index of testosterone levels (Bruckert, Liénard, Lacroix, Kreutzer, and Leboucher, 2006; Dabbs and Mallinger, 1999; Evans et al., 2008; Hollien, 1960). Testosterone is positively associated with short-term mating effort (Gray, Kahlenberg, Barrett, Lipson, and Ellison, 2002; Peters, Simmons, and Rhodes, 2008), and negatively associated with parental investment (Gray et al., 2007) and relationship effort (Booth and Dabbs, 1993; Gray et al., 2002; Gray et al., 2004; van Anders, Hamilton, and

Watson, 2007). Self-reported engagement in extra-pair copulation is significantly higher among men with more masculine bodies as rated by participants (Rhodes, Simmons, and Peters, 2005), and as measured by shoulder-to-hip ratio (Hughes and Gallup, 2003). Women also perceive masculinized male faces as more likely to commit infidelity and as more desirable extra-pair partners (Kruger, 2006). Furthermore, men with relatively high levels of testosterone are more likely to engage in risk-taking behaviors, such as drug use and sexual promiscuity, and are more likely to contract sexually transmitted infections (Booth, Johnson, and Granger, 1999). Therefore, relatively masculine men may be more likely to risk the costs associated with infidelity in favor of the potential reproductive gains, and women's attributions of infidelity risk to such men may aid in avoiding the investment loss and health costs associated with partner infidelity.

Male participants attributed greater infidelity risk to women with voices manipulated to be higher in pitch than those with voices manipulated to be lower in pitch. These findings are consistent with those from Hughes et al. (2004), who found that women with attractive voices report engaging in more extra-pair sex than did women with less attractive voices. Both here and in prior studies, men rate higher-pitched women's voices as more attractive than lower-pitched women's voices (Apicella and Feinberg, 2009; Collins and Missing, 2003; Feinberg et al., 2008b; Jones et al., 2008). Women's vocal femininity is positively related to between-individual estrogen levels (Abitbol et al., 1999), and may also cue menstrual cycle phase (Bryant and Haselton, 2009; c.f. Chae, Choi, Kang, Choi, and Jin, 2001) and so may indicate both state and trait fecundity. Among women, estrogen is positively related to number of long-term relationships, likelihood of adulterous behavior (Durante and Li, 2009), and body femininity (Jasienska et al., 2004). In turn, body femininity is associated with higher sexual desire (van Anders and Hampson, 2005), inducing same-sex jealousy, and engaging in extra-pair sex (Hughes et al., 2004; Hughes and Gallup, 2003). Puts et al. (2011) also found that women with more feminine voices are perceived by other women as more flirtatious and as more attractive to men. Furthermore, women with attractive, feminine voices also have attractive, feminine faces (Collins and Missing, 2003; Feinberg et al., 2005b). Among men, preferences for feminine female voices covary with preferences for feminine female faces, particularly in the context of a long-term relationship (Fraccaro et al., 2010). Women with relatively more feminine faces are more likely to be in long-term relationships (Rhodes et al., 2005), and therefore may have increased opportunities for extra-pair copulation given their desirability as a mate, regardless of relationship context (Scott, Swami, Josephson, and Penton-Voak, 2008). Indeed, increased perceived opportunity for extra-pair sex is a key predictor of infidelity (Atkins, Baucom, and Jacobson, 2001; Treas and Giesen, 2000). Therefore, men's attributions of infidelity to feminine women are adaptive if it aids in avoiding the fitness costs of sexual transmitted infection and cuckoldry.

Our results evidence the influence of morphological indicators of hormonal status on attributions of infidelity risk, though only to opposite sex individuals. The absence of an effect of same-sex pitch manipulations on attributions of infidelity indicates that opposite-sex infidelity attributions were not due to general response biases, but were indicative of the influence of cues to underlying hormonal status on the perception of a potential mates' fidelity.

In the current study, we found a significant sex difference in attributions of infidelity to male, but not female voices; women chose masculinized male voices as more likely to commit infidelity on a significantly higher proportion of trials than did men. It is possible that this discrepancy is due to sex differences in the potential costs of male infidelity. It is potentially adaptive for individuals to be more sensitive to cues of infidelity among potential mates than among non-mates, due to the costs of infidelity to the in-pair partner, such as resource loss (Anderson, Kaplan, and Lancaster, 1999, 2007). If this were the case, we would also expect that men are more sensitive to cues of female infidelity than are other women. In the present study, however, we did not find a significant difference between men's and women's attributions of infidelity to female voices. Future studies may elucidate the disparity of sex differences in the influence of voice pitch on attributions of infidelity.

In the present study, and consistent with prior work (Collins, 2000; Feinberg et al., 2008a, 2005a; Jones et al., 2010; Saxton et al., 2006; Vukovic et al., 2008, 2010) we found that women, but not men, preferred lower-pitched men's voices. Nevertheless, we also found that both men and women preferred higher-pitched women's voices. Other studies have also found that women prefer higher-pitched women's voices (Feinberg et al., 2008b), though not all (Jones et al., 2008, 2010). Indeed, Feinberg et al. (2008b) demonstrated that women generally prefer high-pitched women's voices, but not those that are extremely high, suggesting that women may derogate potential competition (Fisher, 2004). In line with prior research (Feinberg et al., 2008b; Jones et al., 2010), we found that preferences for feminine female voices were greater among men than among women, and preferences for masculine male voices were greater among women than among men, although the differences reported here were non-significant, possibly due to our relatively smaller sample size.

Importantly, we did not find a relationship between variations in preferences for masculinity or femininity and variations in attributions of infidelity. Therefore, individual differences in attributions of infidelity to masculine male and feminine female voices do not appear to reflect variation in preferences for these cues. We can also conclude that our findings are not likely due to a general "halo effect" (Feingold, 1998) where observers infer positive personality traits to individuals with attractive voices (Zuckerman and Driver, 1989). If our results were due to a halo effect, then masculinized male voices and feminized female voices would have been rated as less likely to cheat on their romantic partners, as fidelity is a positive trait. Therefore, explaining the current results in terms of a "halo effect" would be inappropriate for both male and female stimuli.

Participants in our experiment attributed infidelity and attractiveness to different voices by choosing between two versions of a voice, which differed only in voice pitch. Although our results indicated that voice pitch influenced attributions of infidelity and attractiveness, the absence of a significant correlation between these two attributions indicates that voice pitch manipulations did not influence these two attributions to the same degree.

Voice pairs within the attractiveness attribution blocks were different from those voice pairs in the infidelity attribution blocks, except for one male and one female voice pair, which were present in both blocks. Due to the experimental procedure where

participants chose between raised or lowered pitch versions of the same voice, any similarities or differences between different voice pairs are unlikely to influence the results. Other studies of voice preferences have produced equivalent results regardless of whether all participants listened to the same (Feinberg et al., 2006) or to different voices (Puts, 2005). While it is possible that some participants chose the raised or lowered version of a voice present in both blocks as both more attractive and as more likely to cheat, separate analyses on the two overlapping voices failed to detect such a relationship.

In summary, this was the first study to test for associations between vocal sexual dimorphism, preferences for voice pitch, and perceived infidelity. We found that observers' attributions of infidelity were influenced by manipulations of vocal pitch. Women attributed infidelity to masculinized male voices, and men attributed infidelity to feminized women's voices. Infidelity poses potential fitness risks to both sexes, such as loss of resource investment, cuckoldry, sexually transmitted infections, retaliation, and devaluation as a mate (Alatalo et al., 1987; Buss, 1994; Daly and Wilson, 1988; Fitch and Shugart, 1984; Geary and Byrd-Craven, 2004). Infidelity attributions may be the function of an adaptive heuristic that aids in preventing reduced fitness. This type of heuristic may have been particularly crucial for our ancestors, who would have suffered considerable fitness costs if they lost paternity, resources, or parental investment to a same-sex competitor.

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