

**INTER-SEXUAL MATE COMPETITION: A PREVIOUSLY UNRECOGNIZED
FACTOR IN THE EVOLUTION OF HUMAN MATING**

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THE EVOLUTION OF HUMAN MATING

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ABSTRACT

Inter-sexual mate competition occurs any time opposite-sex individuals engage in romantic/sexual competition over the same target. The existence of bisexual behaviour among humans suggests the possibility of inter-sexual mate competition, but it has never been systematically documented. I address this absence with research in three cultures: Canada, Samoa, and the Istmo Zapotec (Southern Mexico). A mixed-method qualitative design was used to document the presence and characteristics of inter-sexual mate competition, and survey and experimental designs were used to understand its potential consequences. Inter-sexual mate competition is both prevalent and consequential in Samoa and the Istmo Zapotec, where women compete against rival women *and* feminine males for the romantic/sexual attention of men. In Canada, where male bisexual behaviour is uncommon, inter-sexual mate competition is rare and inconsequential. Evolutionary models of mating systems and dynamics can be improved by recognizing when and why inter-sexual mate competition occurs.

PREFACE

All research methods described in the empirical chapters that follow received approval from the University of Lethbridge Human Subjects Research Committee, which served as the institutional human ethics review board for this research.

Chapter 2 in this dissertation has been published in an Open Access journal, and Chapters 3 through 7 have been submitted for publication in peer reviewed journals. For all empirical chapters, the author (Semenyna) designed the studies, collected data in Canada, performed all statistical analysis, and wrote the full manuscript. Paul L. Vasey contributed to the editing and revision of all chapters, and all co-authors reviewed manuscripts before submission for publication. The contributions of all co-authors are described below. To avoid unnecessary repetition and length, a single list of references appears at the end of this dissertation.

A version of Chapter 2 has been published. Semenyna, S. W., Gómez Jiménez, F. R., VanderLaan, D. P., & Vasey, P. L. (2020). Inter-sexual mate competition in three cultures. *Plos ONE* 15(7): e0236549. <https://doi.org/10.1371/journal.pone.0236549>. This Open Access publication is distributed under the terms of the Creative Commons Attribution License. Francisco Gómez Jiménez collected data in the Istmo Zapotec. Doug VanderLaan collected portions of the Canadian data. Paul Vasey collected data in Samoa, and aided in study design, as well as editing of the manuscript.

Chapters 3 through 5 consist of manuscripts that have been submitted for publication. Francisco Gómez Jiménez collected data in the Istmo Zapotec. Paul Vasey collected data in Samoa, and provided assistance in study design, as well as editing of the manuscript.

Chapters 6 and 7 consist of manuscripts that have been submitted for publication. Paul Vasey provided assistance in study design, as well as editing of the manuscripts.

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To my family, your support as I pursued this admittedly atypical path has meant a great deal to me. From a young age you instilled in me the need to apply myself, work hard, love learning, and seek a little more improvement each day. Whatever small measure of success I have enjoyed in life I attribute to having such a loving, supportive family.

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Chapter 1: Introduction

Beyond Gay: Male Androphilia in Cross-Cultural Perspective

Research demonstrates that the identity category of “gay” is culturally and historically situated (Murray, 2000; Nanda, 2014; Norton, 1997; Whitam, 1997), and does not necessarily translate precisely to other places and times. In Western societies, the most common form of male androphilia (i.e., sexual attraction to men) is the cisgender one (i.e., “gay men”). *Cisgender androphilic males* behave in a *relatively* masculine manner, and are typically identified as “men” by themselves and others in Western societies. In many non-Western societies, the most common form of male androphilia is the *transgender* one. *Transgender androphilic males*¹ typically behave in an effeminate manner, and in many cultures outside of Euro-American they are recognized as a non-binary “third gender” that is distinct from men or women (Murray, 2000; Nanda, 2014; Whitam, 1997). Examples include the *kathoey* of Thailand, the *xanith* of Oman, the *travesti* of Brazil, the *‘yan dandu* of Nigeria, and the *fakefine* of Tonga, although numerous other examples exist (Murray, 2000; Nanda, 2014).

Although gay men differ in many obvious ways from the gender non-binary androphilic males found in a range of non-Western cultures, both can be accurately described as “androphilic biological males.” Gay men and third gender males obviously differ in terms of gender-identity and gender-role enactment, but the current quantitative evidence indicates that they nonetheless share numerous bio-developmental and psychological correlates. For example, both tend to (a) have similar population prevalence rates (~2-6%), (b) have a preponderance of older biological brothers, (c) be later born among their siblings, (d) cluster within families, (e) exhibit reduced (or

¹ *Male* and *female* are used here to refer to an individual’s biological sex, regardless of whether the individual’s identity or gender role presentation are boy/man, girl/woman, or otherwise.

no) reproduction, and (f) show similar measures of objective sexual attraction to images of men and women (M. L. Chivers, Seto, & Blanchard, 2007; Lawrence, Latty, Chivers, & Bailey, 2005; Petterson, Dixson, Little, & Vasey, 2018). Third-gender androphilic males also share numerous psycho-developmental correlates with Euro-American gay men inasmuch as both tend to exhibit (a) feminine behaviour and interests in childhood, (b) no distress (i.e., dysphoria) regarding their genitals, (c) heightened indicators of childhood separation anxiety, and (d) female-typical occupational interests in adulthood (for reviews of this evidence see Coome, Skorska, & VanderLaan, 2020; Gómez, Semenyna, Court, & Vasey, 2018; Gómez Jiménez, Semenyna, & Vasey, 2020a; Semenyna, VanderLaan, Petterson, & Vasey, 2017; Semenyna & Vasey, 2016). Taken together, this evidence suggests that the trait of male androphilia shares a common etiology, which is then culturally differentiated into either cisgender or transgender expression. Although both forms of male androphilia tend to exist simultaneously in any given culture, the relative proportion tends to be dominated by one type or the other (Whitam, 1983). As already noted, there is evidence that the transgender form of male androphilia represents the ancestral expression of this trait (VanderLaan, Ren, & Vasey, 2013).

The Probable Existence of Inter-Sexual Mate Competition Among Humans

In many cultures worldwide, more than two genders are recognized beyond the gender binary of “man” and “woman.” Numerous world cultures recognize alternative gender roles for highly feminine males, which mark such individuals as neither “men,” nor “women.” Examples include the *bissu* of Sulawesi, the *hijra* of India, the *xanith* of Oman, the *muxes* of Mexico’s Istmo Zapotec, the *‘yan dandu* of Nigeria, and the *fa’afafine* of Samoa, although numerous other examples exist (Murray, 2000; Nanda, 2014). Such males are sometimes referred to in the academic literature as members of a “third-gender,” but might be recognized as gender non-

binary from a Euro-American perspective. Almost without exception, these third-gender males are exclusively *androphilic* (i.e., sexually attracted to adult males), but unlike “gay” men in the West, third gender males living in non-Western cultures do not engage in sexual activity with each other. Rather, they engage in sexual activity with masculine males who self-identify, and are identified by others, as “men” (Murray, 2000; Nanda, 2014; Whitam, 1997). While these cisgender men typically *prefer* women as sexual partners (i.e., they are *gynephilic*), many of them nonetheless readily engage in sexual interactions with feminine males (Pettersson, Dixson, Little, & Vasey, 2020; Whitam, 1997). This pattern of sexual behaviour stands in stark contrast to Western cultures, where bisexual attraction and behaviour is comparatively rare among men (e.g., Gates, 2011; Geary et al., 2018; Laumann, Gagnon, Michael, & Michaels, 1994).

The fact that third-gender males engage in sexual activity with masculine men would seem to create a unique mating problem for women. Namely, in such circumstances, women not only have to compete *intra*-sexually for access to reproductive partners as predicted by Darwinian (1871) sexual selection theory, but they must do so *inter*-sexually as well. While research has demonstrated that women adjust their competitive tactics in response to the degree of mate competition in the local environment (e.g., Barber, 2000; Campbell, 2013, 2016; de Jong, Forsgren, Sandvik, & Amundsen, 2012; Stockley & Campbell, 2013; Weir, Grant, & Hutchings, 2011), it has never before been demonstrated that third-gender males represent one possible source of (inter-sexual) competition. The fact that third-gender males were likely present in the ancestral environment (VanderLaan et al., 2013) makes understanding their impact on female mating strategies (and the broader heterosexual mating landscape) even more important.

Recent research has demonstrated that Samoan men who engage in sexual interactions with feminine males (known locally as *fa'afafine*) exhibit relatively *bisexual* patterns of attraction

based on both subjective (i.e., self-report) and objective measures (i.e., viewing time of male and female stimuli) (Petterson, Dixson, Little, & Vasey, 2015, 2016; Petterson et al., 2020).

Although most Samoan men prefer women as sexual partners, it is commonplace for them to engage in sexual interactions with both *fa'afafine* and women (Petterson et al., 2015, 2016, 2020). In theory, this means that Samoan women must not simply compete with other women for the attention of male mates, but must also engage in inter-sexual mate competition with *fa'afafine*. Although the existence of inter-sexual mate competition in cultures such as Samoa seems reasonable, the phenomenon has never been systematically documented, nor have the implications of inter-sexual mate competition in humans been explored.

Inter-Sexual Mate Competition in Animals and Humans

Inter-sexual mate competition has been described in a variety of non-human species. Anecdotal accounts exist for four avian and 13 non-human mammalian species (Vasey, Leca, Gunst, & VanderLaan, 2014). Quantitative documentation of this phenomenon exists for only a single species: the Japanese macaque (*Macaca fuscata*) (Vasey, 1998). Competition between same-sex members of a species for access to a sexual target is a process of mate acquisition and retention that Darwin (1871) did not appear to recognize (Vasey, Leca, et al., 2014). As such, many examples of inter-sexual mate competition have likely gone completely unreported to date, in part because researchers lack any sort of theoretical framework for even *recognizing* the existence of such interactions, let alone interpreting them.

Historical Illustrations of Inter-Sexual Mate Competition

Although not described overtly as such, some historic examples nonetheless hint at inter-sexual mate competition. In Greek mythology, Hera was aggravated by the numerous affairs of her husband, Zeus, including his erotic involvement a young mortal man, Ganymede (e.g., Sears,

2014). Norton (1997) notes that “Ganymede, far from being just part of a polymorphous *ménage*, was a provoker of marital discord” (p. 49). Greek life imitated Greek mythology (or vice-versa), as illustrated by Demosthenes (384-322 BCE), an Athenian statesman and orator whose “wife complained bitterly when her husband shared his own bed with his boyfriend Cnossia—until, that is, she seduced him herself” (Norton, 1997, p. 53). Such evocative examples of cross-sex romantic/sexual competition have also been observed by other classical historians. For example, Cantarella (1992) notes that:

The fundamental importance of love between men, combined with the widespread prevalence of these relationships throughout the course of Greek history, inevitably had a profound impact on heterosexual relationships, both by determining male attitudes to the female sex and by forcing women to reckon with a sector of their men’s emotional lives from which they were totally excluded. (p. 88)

Although not termed inter-sexual mate competition by the authors, these are nonetheless instances of opposite-sex individuals competing over (or experiencing competitive sentiments about) the same romantic/sexual target. An example from outside the Greco-Roman tradition involves the 12th century Persian mystic and poet, Rumi, who had a passionate love affair with another man until Rumi’s wife forced the two men to separate (Norton, 1997). These examples illustrate that historical instances of inter-sexual mate competition need not involve feminine androphilic males, but are possible any time behavioural bisexuality exists in either sex.

Nonetheless, the existence of feminine males in a population may increase the likelihood that inter-sexual mate competition is manifested, simply because men who prefer women may be more likely to engage in sexual behaviour with feminine same-sex partners as compared to masculine ones.

Inter-sexual mate competition is also possible in cultures where older men engage in pederastic relationships with young or adolescent boys who tend to be more feminine than their adult counterparts (e.g., Hubbard, 2010; Murray, 1995; Percy, 2005). These age-stratified interactions typically involve a young male who is most likely (pre)gynephilic, but nonetheless serves as a sexual facsimile of femininity for his older compatriot. The Greeks referred to such young males as *eromenos*, whereas the older men were termed *erastes* (Cantarella, 1992; Percy, 2005). In Edo era Japan, these young males were referred to as *wakashu* (Mostow, 2003), and somewhat analogous behaviour has been documented in cultures as diverse as Morocco, Turkey, and Pakistan (Murray, 1995), as well as a number of cultures in Sub-Saharan Africa, such as Burkina Faso, where these young males (7-15 years old) were known as *soronés* (Murray, n.d.)². Such interactions presage inter-sexual mate competition of two possible types. The older man (e.g., *erastes* to the ancient Greeks, *nenja* in 17th century Japan), could become jealous as his young male lover (e.g., *eromenos* in Greece, or *wakashu* in Japan) matures somewhat and begins taking female lovers. Alternatively, the wives (or female lovers) of men could become jealous of these male-male relationships and seek to disrupt them in some way. Instances of both occurring in Ancient Greece are described by Cantarella (1992), representing inter-sexual competition dynamics in action. The existence (and fallout) of inter-sexual mate competition is depicted in an anonymously published Japanese picture book from 1675 (*Wakashu-asobi kara no makura*, or *Aloeswood Incense Pillow of Youngman-Play*). One panel portrays a scene in which a man (*nenja*) discovers his *wakashu* having sex with a (female) seamstress (Mostow, 2003). The original caption reads, “they say that when the lover (*nenja*) saw how it was, he became

² Murray (1995, n.d.) discusses both “gender-stratified” sexual activity between adult men and effeminate androphilic males, as well as “age-stratified” sexual activity between adult men and adolescent boys or young men.

disgusted and severed the relationship” (Mostow, 2003, p. 56). A later panel in the *Wakashu-asobi* depicts and describes a woman seducing a *wakashu* away from an older male (panel 9), which is consistent with “several other scenes [that] present men and women as competitors for the affections of *wakashu*, calling the women ‘cunning enemies’” (Mostow, 2003, p. 59) who “compete with adult men for the affections of worthy *wakashu*” (Mostow, 2003, p. 60). Irrespective of whether the book captured reality, or depicted fantasy, inter-sexual mate competition is portrayed. These examples are demonstrative of what Norton (1997) calls a “humorous literature from ancient China to medieval Europe [that is] littered with tales about wives who are anxious or jealous about their husbands’ boyfriends” (p. 53).

Ethnographic Examples of Inter-sexual Mate Competition

Beyond historical inferences about the possible existence of inter-sexual mate competition, rivalry of this type has been described in the ethnographic literature. These examples typically involve women competing against androphilic third gender males for exclusive sexual access to men. For example, (W. W. Hill, 1935) describes feminine males among the Navaho, known as *nadle*³, whose “promiscuity [was] respected rather than censured” (p. 276). Although specific exposition of inter-sexual mate competition is not described, the presence of gender non-binary males whose sexual behaviour with men was not chastised, makes it possible that inter-sexual mate competition occurred between (male) *nadle* and women. A more direct illustration comes from Devereaux (1937), who described a situation in which a Mohave man recounted a quarrel between a previous feminine male lover (an *alyha*), and his new wife. The man stated that the *alyha* “...turned up at my house and wanted to fight with my wife.... I was in the house and heard

³ Hill (1935) also discusses natal females who adopt male roles, also referred to as *nadle*. These gender non-binary females could partner with women, which may have led to inter-sexual mate competition of a different sort as a (female) *nadle* and a man competed over the same woman.

the noise of a fight. My wife and the *alyha* were fighting in the yard outside.... [The *alyha*] picked up a stick and tried to beat my wife with it” (Devereaux, 1937, p. 521-522). In Java, Peacock (1968) describes the way in which “...women condemn the transvestites [*waria*] because the transvestites seduce their husbands” (p. 203-204). Among the Marshallese (Micronesia), Dvorak (2014) relays that “...all [informants] cited examples of bitter dramas and jealousy when a partner in any committed relationship had sex outside the relationship, whether it was with someone of the same-sex or not” (p. 193). Inter-sexual mate competition is also described by Sorenson (1984), who reports that among indigenous peoples of the north-west Amazon, “young men as they return, glistening, from bathing are regarded as especially attractive by members of both sexes” (p. 185). Humorously, women attempted to sexually entice the visiting men, and local men similarly attempted to seduce the visitors to keep them away from the local women (Sorenson, 1984), a clear instance of inter-sexual mate competition. Last, Sander (1993, cited and translated by Whitam, 1997), discussed conflict in Brazil between sex-workers who were women, and those who were effeminate gender non-binary males (*travestis*):

The meeting place became a cemetery called the Alberto Algentário cemetery, which at the time was frequented by female prostitutes until there was a fight in the cemetery between the *travestis* and the female prostitutes. The *travestis* won because the real women had other places to go. In the mid-80’s the Brazilian *travestis* began to move *en masse* from France to Italy. The Italian men were very susceptible to the Brazilian *travestis*’ charms and the Italian media gave them enormous attention. (p. 199)

Hints of inter-sexual mate competition can be found in modern Euro-America. Intersexual mate competition seemingly motivated the murder of a Miami man by a woman who “accused [the victim] of making homosexual advancements toward her boyfriend” (Wilbanks, 1984, p. 343). The recently adopted Canadian legal precedent that ‘same-sex adultery’ constitutes grounds for divorce further illustrates the existence of inter-sexual mate competition (Globe and Mail, 2006; Wise, 2006). Western Tabloids have even (unintentionally) filled the empirical

vacuum pertaining to inter-sexual competition, reporting tensions between the singer Gwen Stefani and her then husband Gavin Rosdale—conflict incited by Rosdale’s previous romantic entanglement with British pop-singer “Marilyn” (Peter Robinson) (Daily Mail, 2010). Aside from these few examples, and documentation of likely inter-sexual mate competition in some non-human animals (Vasey, Leca, et al., 2014), the scholarly record is largely silent on both the existence, and implications of inter-sexual mate competition among humans, although some relevant research has been conducted.

Contemporaneous Research Implying Inter-Sexual Mate Competition

Evolutionary psychologists have overwhelmingly examined human mating psychology as if reproductive interactions were hermetically sealed off from non-reproductive ones (e.g., Buss, 2013; Campbell, 2013; Davies & Shackelford, 2015; Fisher & Cox, 2011; Schmitt, 2014; Walters & Crawford, 1994). This approach, while understandable, does not reflect a more complex (and interesting) reality—reproductive and non-reproductive sex have developed and evolved in concert, with each reciprocally influencing the other (N. W. Bailey & Zuk, 2009; Vasey, 2006; Vasey, Leca, et al., 2014). Indeed, prominent biologists have noted that, “same-sex sexual behaviour is both a trait that is potentially shaped by [natural] selection and a force that shapes selection on other traits” (N. W. Bailey & Zuk, 2009, p. 443). As illustrated above, research that is focused purely on Euro-American conceptions of sexual orientation, gender identity, and sexual behaviour, is liable to miss entirely the existence of inter-sexual mate competition.

In a rare departure from the traditional approach to human heterosexual mating psychology, one research group (Russell, DelPriore, Butterfield, & Hill, 2013; Russell, Ta, Lewis, Babcock, & Ickes, 2017) consider androphilic males as players in the heterosexual mating

arena that impact the mating psychology and behaviour of heterosexual women. This pair of studies demonstrated that heterosexual women in the USA trust the mating relevant advice of gay men more than that of other heterosexual women. This trust is (somewhat accurately) interpreted as being due to the absence of “conflicts of interest.” Gay men in the West do not engage in sexual interactions with heterosexual men, nor are gay men likely to have ulterior motives in seeking friendship with heterosexual women (i.e., they are not cultivating emotional intimacy in hopes of moving toward sexual intimacy). On the one hand, this makes sense if one assumes that that heterosexual women seek out heterosexual men as mating partners and gay men seek out other gay men. On the other hand, this assumption fails to ring entirely true, given that both heterosexual women and gay men are androphilic. Additionally while the pattern of results found by Russell et al. (2013; 2017) appears valid in a Western context, it seems less likely to replicate in cultures where male androphilia is expressed in a feminine third-gender form, and women compete directly with feminine males for access to men.

A separate body of research seems to recognize (albeit implicitly) the potential for sexual competition between gay men and heterosexual women by considering the possibility that heterosexual women’s male partners could commit homosexual infidelities. Some of this research demonstrates that heterosexual women are more distressed by the idea of a male partner’s homosexual infidelity, compared to a heterosexual one (Brewer, 2014; Confer & Cloud, 2011; Wiederman & LaMar, 1998). The authors interpret their results as reflecting the fact that male homosexual affairs would be indicative of a complete absence of sexual interest in one’s female partner and thus, evince the possibility of total abandonment. Although these studies are laudable in their attempt to examine the consequences of having androphilic males

embedded in heterosexual mating systems, it is unclear how culturally-specific these results are because they have only been replicable in those places where “gay” men predominate.

Quantifying the Existence and Consequences of Inter-Sexual Mate Competition

The overarching objective that unifies the studies reported in Chapters 2 through 7 can be summarized as follows: *How does the presence of androphilic males in the social environment influence the sexual behaviour and psychology of women?* As such, I aim to move beyond purely functional questions about *why* androphilic males exist, and instead examine the evolutionary *consequences* of having androphilic males embedded in heterosexual mating systems. This will be undertaken in cultures where male androphilia is expressed in both the transgender form (i.e., third gender males), as well as the cisgender form (i.e., gay men). More specifically, inter-sexual mate competition will be examined in Samoa, where androphilic males are recognized as *fa’afafine*, among the Istmo Zapotec of Southern Mexico who recognize androphilic males as *muxes*, and in Canada, where androphilic males are (typically) gay men. It is essential that studies aimed at understanding the evolution of inter-sexual mate competition include data from cultures where the ancestral form of male androphilia—the transgender form—is expressed. However, data from cultures where male androphilia is expressed in the cisgender form, such as Canada, are also valuable.

Although the research questions and methodologies employed in the following chapters are diverse, they share a common aim of understanding of how the presence of androphilic males impacts heterosexual mating. Chapter 2 examines the frequency of inter-sexual mate competition between women and androphilic males in three cultural locales—Samoa, the Istmo Zapotec, and Canada—as well as the features of such competition when they do occur. Chapter 3 is an extension of this research, using data from Samoa and the Istmo Zapotec to examine two inter-

related research questions: 1) How is the mate-competition behaviour of rival women and *fa'afafine/muxes* similar or dissimilar, and 2) are women's behavioural responses to intra-sexual mate competition rivals similar or dissimilar to their responses to inter-sexual mate competitors? Chapter 4 examines Canadian, Samoan, and Istmo Zapotec women's reaction to hypothetical infidelity scenarios wherein they imagine their partners engaging in sexual infidelity that is either opposite-sex in nature, or with a same-sex partner. Chapter 5 also compares women across these same cultures, using an experimental paradigm to examine the trust placed in a potential inter-sexual rival interacting alone with their boyfriend/husband, as compared to potential intrasexual rival (i.e., a heterosexual woman). The focus of Chapter 6 and 7 is on Canadian women. Both studies sought to use experimental priming to understand if Canadian women can be induced to think of androphilic males (i.e., gay men) as potential mate competitors. Chapter 6 examines whether such primes impact the relative trust that women place in gay men. Chapter 7 is a conceptual replication of women's ability to accurately categorize male sexual orientation based exclusively on pictures of faces, seeking to extend this research by examining whether this ability is moderated by either experimental priming or fertility status. Last, Chapter 8 summarizes and integrates the findings of Chapters 2 through 7, exploring some theoretically relevant considerations and areas of future investigation.

Chapter 2: Inter-Sexual Mate Competition in Three Cultures

Abstract

Darwinian sexual selection theory holds that mate selection occurs inter-sexually, and mate competition occurs intra-sexually for opposite-sex partners. We demonstrate that *inter*-sexual mate competition can also occur among humans at appreciable rates that vary by culture. In Canada, inter-sexual mate competition was both rare and inconsequential. However, data from two disparate non-Western cultures—Samoa and the Istmo Zapotec (Oaxaca, Mexico)—show that women frequently compete with feminine same-sex attracted males to acquire and maintain masculine male mates (i.e., men). Inter-sexual mate competition most commonly involved feminine males attempting to poach women’s masculine male sexual partners. During these interactions, women and feminine males both attempted to manipulate the man who was the object of sexual competition; feminine males attempted to entice the target man, whereas women engaged in guarding and emotionally punitive behaviours. We do not anticipate that inter-sexual mate competition will be common in most species or across all cultures. However, when males and females prefer the same sexual partners, who themselves behave in a bisexual manner, then inter-sexual mate competition can ensue.

Keywords: sexual selection; inter-sexual competition; cross-cultural research; male androphilia

Introduction

A core tenet of Darwinian sexual selection theory is that mate selection occurs inter-sexually, and competition occurs intra-sexually for opposite-sex partners, a pattern that has been documented in most species (Janicke, Häderer, Lajeunesse, & Anthes, 2016). Sexual selection is known to favor individuals who demonstrate flexibility in the means by which they compete for reproductive partners (Barber, 2000; Stockley & Campbell, 2013), and varied intra-sexual mate competition tactics are both widespread and well documented (Brewer & Hamilton, 2014; Buss, 1988a; Buss, Shackelford, & McKibbin, 2008; Fisher & Cox, 2011). In this study, we demonstrate that when males and females prefer the same sexual partners, who themselves behave in a bisexual manner, then *inter*-sexual mate competition can ensue. Quantitative study of inter-sexual mate competition exists for only one species, Japanese macaques (*Macaca fuscata*), in which males and females compete for female sexual partners (Vasey, 1998). Anecdotal evidence suggest that males and females compete inter-sexually for sexual partners in at least fourteen additional non-human species across eight different avian and mammalian Orders, and ethnographic anecdotes suggest that inter-sexual mate competition also occurs in humans (Vasey, Leca, et al., 2014).

Gender complicates discussions of inter-sexual mate competition in humans because same-sex sexual interactions can be structured in a manner that is *homogendered* (i.e., partners occupy the same gender category) or *heterogendered* (i.e., partners occupy different gender categories) (Murray, 2000). In the contemporary West, same-sex sexual interactions are usually homogendered, typically occurring between two “gay” men or two “lesbian” women (J. M. Bailey et al., 2016). However, in many non-Western cultural contexts, same-sex interactions are heterogendered, because they occur between a cisgender individual and a partner who occupies a

culturally-recognized gender category that exists beyond the “man” or “woman” binary (Murray, 2000; Nanda, 2014; Whitam, 1997). In particular, feminine biological males in many non-Western cultures are not seen as “men” nor “women,” but rather as a non-binary third gender (Nanda, 2014; Vasey & VanderLaan, 2014). Examples of feminine, non-binary males include the *bissu* of Sulawesi, the *hijra* of India, the *xanith* of Oman, and the *'yan dandu* of Nigeria (Murray, 2000). From the perspective of psychobiology, the most well studied third-gender males are the Samoan *fa'afafine* (Vasey & VanderLaan, 2016) and the Istmo Zapotec *muxes* of Oaxaca, Mexico (Mirandé, 2017). These individuals are almost always exclusively androphilic (i.e., sexually attracted and aroused to adult males), and display the same correlates of male androphilia documented among Western gay men, such as gender atypicality in childhood, more older brothers, more androphilic relatives, and a prevalence rate of ~2-5% (Gómez et al., 2018; Semenyna, VanderLaan, Petterson, et al., 2017; Vasey & VanderLaan, 2014). Gender non-binary males such as these rarely, if ever, engage in sexual activity with each other, but instead engage in sexual activity with masculine males (i.e., men). Most of the men who engage in sexual activity with *fa'afafine* and *muxes* also engage in sexual activity with women, preferring the latter as sexual partners (Mirandé, 2017; Petterson et al., 2015). Although male androphilia does not vary appreciably across historical (Leser, 1961) or cultural (Rahman, Xu, Lippa, & Vasey, 2019; Whitam & Mathy, 1986) contexts (i.e., $\leq 5\%$ of males), gynephilic men's willingness to engage in sexual activity with feminine males varies considerably across different cultural milieus (Fernández-Alemany & Murray, 2002; Whitam, 1992). Importantly, in both Samoa and among the Istmo Zapotec, there is widespread cultural tolerance, and in certain contexts even celebration, of *fa'afafine* (Vasey & Bartlett, 2007) and *muxes* (Mirandé, 2016).

A number of ethnographic accounts suggest that inter-sexual mate competition occurs

between women and gender non-binary males. For example, a Mohave gender non-binary male (*alyha*) incited a fight against the wife of a man who was a former lover, with the man interceding to prevent a physical altercation between his new bride and the *alyha* (Devereaux, 1937). Similar tension has been described between Javanese women and gender non-binary males (*waria*) who attempt to seduce their husbands (Peacock, 1968). Presently, we sought to move beyond anecdotal accounts of human inter-sexual mate competition, and instead document the phenomenon more systematically in three distinct cultures: Canada, Samoa, and among the Istmo Zapotec of Oaxaca, Mexico.

First, we aimed to document the frequency of inter-sexual mate competition in these three cultures. Because it is virtually certain that most *fa'afafine* and *muxe* have engaged inter-sexual mate competition, data collection focused on the experiences of women, who also represent the reproductive competitors most relevant to sexual selection. We predicted that Canadian women's experiences of inter-sexual mate competition would be relatively rare because male bisexuality occurs infrequently in Western cultural contexts (J. M. Bailey et al., 2016) and heterosexual men are largely disinterested in same-sex contact with gay men. In contrast, we predicted that Samoan and Istmo Zapotec women would report relatively high levels of inter-sexual mate competition because both *fa'afafine* and *muxes* routinely engage in sexual activity with masculine men who behave bisexually. Second, we endeavored to document the features of inter-sexual mate competition when it occurs, applying established mate-competition tactics taxonomies (e.g., Barbaro, Shackelford, & Weekes-Shackelford, 2016; Brewer & Hamilton, 2014; Buss, 1988a; Buss et al., 2008; Vanderlaan & Vasey, 2008) to qualitative accounts of such interactions. Given the anticipated rarity of inter-sexual mate competition in Canada, we expected that women would dismiss such competition as trivial when it did occur, and engage in few mate-competition

tactics. Conversely, we predicted that both Samoan and Istmo Zapotec women would perceive inter-sexual competition as a genuine threat, engaging in mate attraction tactics (e.g., flirting, appearance enhancement) during acquisition contests, and mate-retention strategies (e.g., guarding and relationship-manipulation) when *fa'afafine* or *muxe* attempted to poach their mates.

Method

All study measures were approved by the office of research ethics at the University of Lethbridge. A Samoan research visa was obtained from the Samoa Immigration Office with the support of the Samoan *Fa'afafine* Association. Canadian foreign nationals, and US Citizens, are permitted to conduct research in Mexico for a period of 180 days if they have a valid passport (Consulado de Carrera de México en Toronto, 2020). In addition, however, we obtained a letter endorsing our research from the Office of the Municipal President in Juchitán, Mexico. All participants signed informed consent forms before participation, and completed basic biodemographic measures including age, relationship status, and a 7-point Kinsey-style sexual orientation measure (Kinsey, Pomeroy, & Martin, 1948).

Participants

Data were collected from three Canadian sub-samples of women, two from undergraduate research pools ($n = 138$ and 144 respectively), and a community sample of non-student participants from a pub and eatery in a small city in Southern Alberta, Canada ($n = 62$). The pooled Canadian sample ($n = 344$) had an average age of 25.10 years ($SD_{\text{age}} = 11.68$, range 17-70), with most women (76.7%) in committed romantic relationships with men for a median of 2 years among undergraduates, and ≥ 10 years among the community sample. The Canadian sample was comprised primarily of Caucasian women (80.2%) with the remainder including other ethnicities (primarily South Asian, East Asian, Canadian First Nations, or “other”). The

majority of Canadian women were exclusively or mostly heterosexual (93.9%), with the remainder reporting some attraction to women (i.e., Kinsey 2-4, all of whom were in relationships with men). We interviewed Samoan women ($n = 128$) on the island of Upolu in the Independent State of Samoa, a Polynesian island nation in the South Pacific. The average age of the Samoan women was 33.96 years ($SD_{age} = 11.7$, range 19-70). Most women were in heterosexual relationships (26 dating, 89 married), although some ($n = 13$) were single. Nearly all Samoan women were exclusively heterosexual (Kinsey 0), although one woman was bisexual (Kinsey 3). We also interviewed indigenous Zapotec women ($n = 100$) in the Istmo region (Juchitán and Tehuantepec districts) of Oaxaca, Mexico. The average age of the Istmo Zapotec women was 32.55 ($SD_{age} = 10.6$, range 18-70). Most were in heterosexual relationships (18 dating, 59 married), but some ($n = 23$) were single. Most were exclusively attracted to men ($n = 93$), but some were mostly heterosexual (Kinsey 1; $n = 6$) and one was bisexual (Kinsey 3).

Women were asked whether they had ever experienced a situation in which they and a gay man, *fa'afafine*, or *muxe* (depending on culture) were simultaneously interested in, and competed for, the romantic/sexual attention of the same man. Participants who answered in the affirmative were then asked to provide detailed information about how the interaction unfolded. Interviewers sought clarification as necessary in order to ascertain details of the event, or specific tactics employed by the participants or their rivals, but participants otherwise gave free responses.

Treatment of Data

All narrative recounts of mate-competition interactions were audio recorded, and later transcribed and translated (when necessary). Each narrative was coded by two independent raters using a psychometrically validated mate retention inventory taxonomy (Brewer & Hamilton,

2014; Buss, 1988a; Pham, Barbaro, & Shackelford, 2014) (See Appendix 1). Each interaction was coded by the first author, as well as a research assistant trained in applying the mate competition taxonomy but blind to study hypotheses. Inter-rater reliability was high (Canada: 95.24±3.53% agreement, mean Cohen's *Kappa* = .76, *SD* = 0.17; Samoa: 92.86±4.23% agreement, mean Cohen's *Kappa* = .69, *SD* = .18; Istmo Zapotec: 92.86±4.76% agreement, mean Cohen's *Kappa* = .69, *SD* = .18) and disagreements were resolved via discussion between the raters until consensus was reached. Tactics were coded as either present or absent for each competitor in an interaction. Cumulative frequencies were then calculated, and the presence/absence of each tactic compared between women and male competitors using 2 X 2 contingency tables. Due to the large number of statistical comparisons presented in Tables 1–4, attempts were made to balance Type I and Type II errors by treating Fisher's Exact (GraphPad, 2020) two-tailed *p*-values as suggestive if they fell below *p* = .05, and significant only if they fell below *p* = .005 (Benjamin et al., 2018).

Results

Frequency of Inter-Sexual Mate Competition

Among the 344 women in our Canadian sample, 52 (15.1%) had experienced inter-sexual mate competition. Because some women indicated that they experienced inter-sexual mate competition, but either declined to elaborate or provided too few details for meaningful analysis, there were 28 inter-sexual mate competition events detailed enough for analysis. Overall, 43% of Samoan women reported that they engaged in inter-sexual mate competition for a man with a *fa'afafine* rival, yielding 51 inter-sexual mate competition events detailed enough for analysis. Among women in the Istmo Zapotec, 85% reported that they engaged in inter-sexual mate competition for a man with a *muxe* rival, yielding 108 unique inter-sexual mate competition

events. Among these narratives, 6 women recounted only acquisition stories, 52 recounted only retention stories (accounting for 53 stories due to one participant providing two instances), and 24 women told stories detailing both acquisition and a retention competition (accounting for 24 instances of mate acquisition, and 25 instances of mate retention due to a second woman providing two stories). The frequency of inter-sexual mate competition significantly differed across cultures, $\chi^2(2, N = 572) = 176.2, p < .001$, and all pairwise comparisons were significant (Fisher's Exact $p < .001$).

In all three cultures, inter-sexual competition occurred in which both competitors attempted to acquire a masculine male mate (Canada: $n = 9$; Samoa: $n = 10$; Istmo Zapotec: $n = 30$). However, the most common type of inter-sexual mate competition involved a woman attempting to retain her masculine male mate in the face of a male rival who endeavored to poach that mate (Canada: $n = 19$; Samoa: $n = 41$; Istmo Zapotec: $n = 78$).

Features of Canadian Inter-Sexual Mate Competition Events

Table 2.1 presents data for inter-sexual mate competitions in Canada. Because there were only 9 instances of inter-sexual mate competition for acquiring a mate, only data for mate poaching/retention interactions ($n = 19$) are presently reported. Although overall rates of most tactics tended to be low, both women and their gay male rivals directed their behaviours towards the target man, rather than toward each other. This involved gay men directing significantly more positive inducements, especially flirting, toward the target male, and women showing a suggestive difference in guarding behaviour (i.e., vigilance). In 47.4% of mate retention/poaching interactions, Canadian women reported engaging in no mate competition tactics whatsoever. This response underscores what many women conveyed qualitatively—target men were disinterested in same-sex contact and rebuffed male advances, and women did not

perceive androphilic males as genuine rivals.

Table 2.1

Inter-Sexual Mate Competition Retention/Poaching Tactics in Canada

	Percentage Reported	
	Female Participant (<i>n</i> = 19)	Male Rival (<i>n</i> = 19)
Target Manipulation	47.4	94.7*
Guarding	36.8	5.3 [†]
Direct Guarding	5.3	0
Vigilance	31.6	0 [†]
Concealment	10.5	0
Monopolize	21.1	5.3
Negative Inducements	15.8	10.5
Jealousy Induction	0	0
Punish Infidelity Threat	5.3	0
Emotional Manipulation	5.3	0
Commitment Manipulation	15.8	5.3
Derogate Competitor	0	5.3
Positive Inducements	15.8	89.5*
Resource Display	0	10.5
Sexual Inducement	5.3	31.6
Appearance Enhancement	0	0
Love and Caring	0	10.5
Submission & Debasement	0	0
Direct Contact	5.3	63.2*
Personality Advertisement	5.3	10.5
Gain Access	0	36.8 [†]
Competitor Manipulation	15.8	10.5
Signal Possession	10.5	0
Verbal Possession Signals	5.3	0
Physical Possession Signals	5.3	0
Possessive Ornamentation	0	0
Negative Inducements	10.5	10.5
Derogate Target	0	0
Threatened Competitor	5.3	1
Violence against Rival	0	0
Direct Action	5.3	10.5
Capitalize on Opportunity	0	10.5
Coalitional Strategy	0	0
Strategy Matching	5.3	0

Note: Global competitive strategies are bold, beneath which individual competitive tactics are listed.

[†] $p < .05$; * ($p < .005$) indicates a significant difference between the competitive strategies or tactics employed by competitors.

Features of Samoan Inter-Sexual Mate Retention Events

Table 2.2 presents data for inter-sexual mate competitions in Samoa, including participants' reported behaviour, as well as that of the *fa'afafine* interloper. Because there were only 10 instances of inter-sexual mate competition for acquiring a mate, only data for mate poaching/retention interactions are reported. Participants directed the majority of their tactics toward their masculine male mate, using negative inducements as well as being vigilant against the advances of their rival. Conversely, *fa'afafine* focused most of their efforts on the target man, employing direct contact (flirting, etc.) as well as sexual inducements in a high number of competitive interactions. Women's response to *fa'afafine* attempting to poach their mates was warranted, as *fa'afafine* successfully seduced their partners in 27% of reported retention/poaching events. One example involved a woman returning to her husband's hospital room only to find the room vacant because a *fa'afafine* nurse had absconded with the man. Upon the eventual return of her husband, this woman insisted that he return home from the hospital, despite his reluctance to do so. Qualitatively, numerous women noted the intensity with which *fa'afafine* competed for the time and attention of target men. A 46-year-old woman, who was intimidated by a *fa'afafine* in a Samoan nightclub attempting to poach her mate, said, "when the *fa'afafine* get angry they are like lions—even with women. Heaps of *fa'afafine* give ladies a real hiding when they are angry."

Features of Istmo Zapotec Inter-Sexual Mate Acquisition Events

Table 2.3 reports mate acquisition tactics in the Istmo Zapotec. Participants and their *muxe* competitors both directed most behaviour at the target male. *Muxe* were significantly more likely to direct positive inducements toward the target, including sexual provocations. Indeed, numerous female participants commented on *muxe*'s ability to engage in overtly sexual and

Table 2.2

Inter-Sexual Mate Competition Retention/Poaching Tactics in Samoa

	Percentage Reported	
	Female Participant (n = 41)	Fa'afafine Rival (n = 41)
Target Manipulation	90.2	92.3
Guarding	53.7	12.2*
Direct Guarding	4.9	0
Vigilance	41.5	4.9*
Concealment	14.6	4.9
Monopolize	7.3	4.9
Negative Inducements	70.7	2.4*
Jealousy Induction	2.4	0
Punish Infidelity Threat	43.9	0*
Emotional Manipulation	39.0	0*
Commitment Manipulation	22.0	0*
Derogate Competitor	2.4	2.4
Positive Inducements	24.4	87.8*
Resource Display	4.9	26.8
Sexual Inducement	2.4	46.3*
Appearance Enhancement	9.8	17.1
Love and Caring	12.2	7.3
Submission & Debasement	2.4	0
Direct Contact	4.9	56.1*
Personality Advertisement	0	2.4
Gain Access	0	29.3*
Competitor Manipulation	34.1	39.0
Signal Possession	24.4	26.8
Verbal Possession Signals	19.5	14.6
Physical Possession Signals	4.9	14.6
Possessive Ornamentation	0	0
Negative Inducements	19.5	22.0
Derogate Target	0	4.9
Threatened Competitor	7.3	9.8
Violence against Rival	4.9	9.8
Direct Action	14.6	7.3
Capitalize on Opportunity	0	24.4*
Coalitional Strategy	31.7	7.3
Strategy Matching	9.8	9.8

Note: Global competitive strategies are bold, beneath which individual competitive tactics are listed.

* ($p < .005$) indicates a significant difference between the competitive strategies or tactics employed by competitors.

flirtatious behaviours that would receive social censure if displayed by women. All individuals in these mate acquisition interactions primarily sought to impress the target male with positive inducements, although *muxes* employed these tactics more vigorously.

Features of Istmo Zapotec Inter-sexual Mate Retention Events

Table 2.4 reports the frequency of tactics used during inter-sexual mate retention/poaching competitions. Within these interactions, participants' behaviour tended to reliably differ from that of the *muxe* interloper. *Muxes* tended to employ tactics meant to entice the target male in some way (e.g., sexual inducements, flirtatious direct contact), and participants responded, in turn, by targeting their mate with negative inducements meant to secure their relationship. Despite the fact that *muxes* frequently engaged in overt sexual provocations of target men, 24.4% of female participants indicated that they did nothing in response to a *muxe* interloper because they believed that their partners were exclusively interested in women. Nevertheless, inter-sexual mate poaching interactions culminated with the *muxe* competitor having sex with the female rival's masculine male mate 12% of the time. Some participants reported having reacted negatively during inter-sexual mate poaching attempts. A succinct qualitative illustration of this was given by a 27-year-old Zapotec woman:

Yes, it was at a party that I was attending with my partner. A *muxe* came to talk to my partner. I overheard them talking, and I remember the *muxe* speaking very fondly to him. I got jealous. They stood up and walked away to be more distant. While it was happening, I would look at him very angry, as if saying 'what's going on there?' He would look at me and just laugh, which made me even more upset. I didn't say anything, but later I turned around and saw that they were kissing. I got mad and left the place. I never heard from them again, nor do I want to. The *muxe* knew that we came together.

Table 2.3

Inter-Sexual Mate Acquisition Competition Tactics in the Istmo Zapotec

	Percentage Reported	
	Female Participant (<i>n</i> = 30)	<i>Muxe</i> Rival (<i>n</i> = 30)
Target Manipulation	80.0	96.7
Guarding	16.7	20
Direct Guarding	0	3.3
Vigilance	10.0	6.7
Concealment	6.7	3.3
Monopolize	0	10.0
Negative Inducements	36.7	26.7
Jealousy Induction	0	0
Punish Infidelity Threat	6.7	0
Emotional Manipulation	16.7	3.3
Commitment Manipulation	10.0	3.3
Derogate Competitor	13.3	26.7
Positive Inducements	63.3	93.3*
Resource Display	3.3	20.0
Sexual Inducement	6.7	23.3
Appearance Enhancement	23.3	13.3
Love and Caring	36.7	33.3
Submission & Debasement	3.3	0
Direct Contact	46.7	76.7
Personality Advertisement	6.7	0
Gain Access	30.0	23.3
Competitor Manipulation	46.7	66.7
Signal Possession	26.7	46.7
Verbal Possession Signals	26.7	43.3
Physical Possession Signals	0	3.3
Possessive Ornamentation	0	0
Negative Inducements	33.3	46.7
Derogate Target	3.3	6.7
Threatened Competitor	3.3	10.0
Violence against Rival	0	0
Direct Action	26.7	40.0
Capitalize on Opportunity	3.3	6.7
Coalitional Strategy	10.0	6.7
Strategy Matching	20.0	20.0

Note: Global competitive strategies are bold, beneath which individual competitive tactics are listed.

* ($p < .005$) indicates a significant difference between the competitive strategies or tactics employed by competitors.

Table 2.4

*Inter-Sexual Mate Competition Retention/Poaching Tactics
in the Istmo Zapotec*

	Percentage Reported	
	Female Participant (<i>n</i> = 78)	<i>Muxe</i> Rival (<i>n</i> = 78)
Target Manipulation	66.7	96.2*
Guarding	33.3	2.6*
Direct Guarding	3.8	1.3
Vigilance	23.1	0*
Concealment	9.0	0
Monopolize	3.8	2.6
Negative Inducements	60.3	10.3*
Jealousy Induction	0	1.3
Punish Infidelity Threat	43.6	0*
Emotional Manipulation	23.1	0*
Commitment Manipulation	14.1	0*
Derogate Competitor	6.4	10.3
Positive Inducements	5.1	94.9*
Resource Display	0	23.1*
Sexual Inducement	1.3	43.6*
Appearance Enhancement	1.3	15.4*
Love and Caring	2.6	34.6*
Submission & Debasement	0	1.3
Direct Contact	2.6	62.8*
Personality Advertisement	0	1.3
Gain Access	1.3	35.9*
Competitor Manipulation	35.9	32.1
Signal Possession	24.4	16.7
Verbal Possession Signals	20.5	15.4
Physical Possession Signals	3.8	1.28
Possessive Ornamentation	0	0
Negative Inducements	17.9	24.4
Derogate Target	0	0
Threatened Competitor	6.4	2.6
Violence against Rival	3.8	0
Direct Action	10.3	23.1
Capitalize on Opportunity	1.3	21.8*
Coalitional Strategy	3.8	0
Strategy Matching	3.8	2.6

Note: Global competitive strategies are bold, beneath which individual competitive tactics are listed.

* ($p < .005$) indicates a significant difference between the competitive strategies or tactics employed by competitors.

Discussion

The present study documented the frequency and features of inter-sexual mate competition—females and males competing for the same romantic/sexual target—in three cultures. In Canada, where male bisexuality is relatively infrequent, such competition was rare, and features of inter-sexual mate competition events belie the fact that it was not taken seriously by many women. However, male bisexual behaviour is relatively more common in both Samoa and among the Istmo Zapotec, where masculine men regularly engage in sexual interactions with feminine *fa'afafine* and *muxe* respectively (Mirandé, 2017; Petterson et al., 2015). In both cultures, women reported frequently engaging in inter-sexual mate competition against gender non-binary males, at rates that are appreciably higher than those found in Canada. It is possible that inter-sexual mate competition is more frequent in the West than was reported, but instances went unnoticed by Canadian women not anticipating such rivalry. Conversely, the Samoan and Istmo Zapotec data may over-estimate the true prevalence of inter-sexual mate competition, because women in these contexts are attuned to the possibility of competition with feminine *fa'afafine* and *muxe*, who are fully integrated in the culture.

Given that gender non-binary males represent 2-5% of the male population in both Samoa and the Istmo Zapotec (Gómez et al., 2018; Semenyna, Petterson, VanderLaan, & Vasey, 2017), it is perhaps surprising that 43% and 85% of women in each respective culture report having ever experienced inter-sexual mate competition. This seeming disparity highlights two important likelihoods. First, gender non-binary males are engaging in high degrees of mate acquisition behaviour, much of it in short-term contexts to acquire or mate-poach target men. Both *fa'afafine* and *muxes* seem to evidence a preference for short-term mating and a variety of novel sexual partners, a pattern consistent with the mating psychology/behaviour of Euro-

American gay men (J. M. Bailey, Gaulin, Agyei, & Gladue, 1994; Lippa, 2007; Symons, 1979). Second, we did not ascertain the extent to which participant women competed with the same *fa'afafine* or *muxe*. Consequently, it is possible that a small absolute number of gender non-binary males are implicated in the high overall prevalence of inter-sexual mate competition. In other words, many participants may have engaged in mate competition against the same gender non-binary males. If so, the reported inter-sexual mate competition rivals may not be completely independent. Given that data were collected in numerous villages around the island of Upolu (Samoa), and the surrounding areas of Juchitán de Zaragoza (Oaxaca), we caution against over endorsement of this possibility. In any case, each mate competition event reported here represents an independent and unique interaction between a participant woman and a rival feminine male.

Despite the disparate cultural milieus in which these interactions took place, Samoan and Istmo Zapotec women employed similar strategies and tactics during inter-sexual mate poaching/retention interactions, as did *fa'afafine* and *muxes*. Women and gender non-binary males both attempted to manipulate the man who was the object of competition. They differed, however, in terms of the strategies they employed, given that female competitors were attempting to retain their masculine male mates, while gender non-binary male competitors were attempting to poach them. Samoan and Istmo Zapotec women were more likely to employ strategies such as Negative Inducements toward their mate (tactics: threat of retaliatory infidelity, emotional manipulation, demands for total commitment) and Mate Guarding (tactic: vigilance of mate). In contrast, *fa'afafine* and *muxe* competitors were more likely to employ strategies such as Positive Inducement (tactics: flirting, offers of sex) and Gaining Access (tactic: active attempts to interact with the masculine male target). Put simply, Samoan and Istmo

Zapotec women were likely to engage in cost-inflicting mate retention behaviours, whereas feminine males employed benefit-provisioning poaching behaviours, mirroring the patterns observed in many intrasexual mate competitions in Euro-American cultures (Pham et al., 2014). Gender non-binary males were also more likely to Capitalize on Opportunities that arose fortuitously, thereby facilitating attempts to entice masculine men in the absence of their female partners.

We do not expect that inter-sexual mate competition will be common in most species, or even in most human cultures. Nonetheless, when an appreciable number of individuals of one sex behave bisexually, then members of the opposite sex may be compelled to engage in inter-sexual mate competition to acquire and maintain reproductive partners when faced with rivals who are exclusively same-sex attracted. Depending on the species or the culture under consideration, one sex may behave in a relatively more bisexual manner than the other (Goy & Goldfoot, 1975) and this will affect that manner in which inter-sexual mate competition is manifested. For example, inter-sexual mate competition for male sexual partners may be more prevalent in non-Western cultures where many masculine men behave bisexually, engaging in sexual interactions with both women and gender non-binary males (Pettersson et al., 2015; Vasey, Leca, et al., 2014; Vasey & VanderLaan, 2016; Whitam, 1992). In contrast, inter-sexual mate competition for female sexual partners may be more prevalent in Western cultures, where female bisexual behaviour is relatively more common (Gates, 2011; Geary et al., 2018), as is the case among the only other species for which data on inter-sexual mate competition exist, Japanese macaques (Vasey, 1998).

All inter-sexual mate competition interactions involve a reproductive competitor and a non-reproductive one. Because we were interested in inter-sexual mate competition within the

context of sexual selection, data collection focused on the experiences of reproductive competitors (i.e., Canadian, Samoan, and Istmo Zapotec women). Women's mate competition narratives could be biased, however, inasmuch as participants presented themselves in a favorable light, or were absent when competitors employed certain tactics. In the future, a more comprehensive understanding of these interactions could be obtained by detailing the experiences of the non-reproductive competitors (i.e., gay men, *fa'afafine*, and *muxe*) as well, examining the possibility that women may attempt to poach the partners of same-sex attracted males. Additionally, the stories of inter-sexual mate competition comprising the present data set were undoubtedly richer and more complex than remembered and conveyed by participants, and the details put forth were then further stripped of information as behaviours were categorized using the taxonomy employed. Despite these limitations, some useful conclusions nonetheless emerged from the snapshot of inter-sexual mate competition provided by our female participants. Observational field-studies could help to fill in some of the potential gaps, although such research is difficult to conduct among humans, especially when the behavioural phenomena in question occur infrequently. It may also be possible to study inter-sexual mate competition in laboratory settings, examining women's reaction to a male confederate who does or does not convey cues of engaging in inter-sexual mate competition.

Like intra-sexual competition for mates, inter-sexual mate competition involves strategies and tactics that can potentially influence the reproductive competitor's access to reproductive partners. It is of great interest to determine whether inter-sexual mate competition involves uniquely evolved strategies, or if competitors simply co-opt strategies that are used in more commonly occurring intrasexual contests. In those species that engage in inter-sexual mate competition, our understanding of sexual selection and the evolution of mating systems may be

improved by investigating the potential role that these interactions play in the acquisition and retention of reproductive partners. Such investigations will aid in developing a theoretical framework for understanding and making predictions about inter-sexual mate competition, moving beyond the basic description of the present research. Indeed, while much remains unknown regarding the *causes* of non-heterosexual attractions (J. M. Bailey et al., 2016), future research should also investigate their social and sexual *consequences*, including the possibility that same-sex attractions and behaviours can act as a cultural and evolutionary force (N. W. Bailey & Zuk, 2009; Vasey, 2006) impacting the broader heterosexual mating market.

Chapter 3: Intra- and Inter-Sexual Mate Competition in Two Cultures: A Comparison of Women's Response to Mate Competition with Women and Gender Non-Binary Males in Samoa and the Istmo Zapotec

Abstract

The present study examined women's mate competition tactics in response to both female and feminine-male rivals, in two cultures in which both types of competition occur. In Samoa and the Istmo Zapotec (Southern Mexico), women not only compete with other women (intra-sexually), but also compete with rival feminine males (inter-sexually) in order to access/retain the same masculine men as sexual/romantic partners. Within-culture, the likelihood that participant women had ever experienced intra- and inter-sexual mate competition did not differ. Furthermore, participants reported a similar pattern of behavioural tactics whether their rival was another woman, or a feminine male. These included benefit provisioning tactics during mate acquisition, and cost-inflicting tactics during mate retention. Similarly, the mate competition tactics reportedly employed by rival women and rival feminine males bore a striking resemblance to each other, focusing on enticing target men. Results highlight not only the mate competition tactics employed by women outside of a Euro-American context, but also the way in which cultural factors impact mating landscapes presumed to be heterosexual. The presence of feminine males, alongside masculine men's willingness to engage in sexual activity with them, induces women in such cultures to compete inter-sexually in comparable ways, and at comparable rates, to intrasexual competition with rival women.

Keywords: inter-sexual mate competition; male androphilia; qualitative research; cross-cultural research.

Introduction

Acquiring and retaining a mate has been a recurrent adaptive problem among humans (Buss & Schmitt, 2019; Darwin, 1871). Differential parental investment (Trivers, 1972), including women's obligate care and men's greater variability in reproductive potential, has created select sex differences in mate preferences (Buss, 1989; Conroy-Beam, Buss, Pham, & Shackelford, 2015), and subsequent sex differences in mate-competition tactics (Buss, 1988a, 1988b; Fisher & Cox, 2011; Walters & Crawford, 1994). Although the sexes largely employ the same behavioural repertoire of mate competition tactics, some sex differences in the frequency with which these tactics are employed are apparent. For example, men are somewhat more likely to advertise status and resources, whereas women are more likely to emphasize youth and beauty (Buss, 1988a, 1988b; Buss et al., 2008). Traditional models of mate competition and selection emphasized male competition followed by female choice (Darwin, 1871; Trivers, 1972). More recent theorizing has explicated the numerous ways in which both males and females compete intra-sexually, with each sex then exercising mutual mate choice for desirable opposite-sex partners (Janicke et al., 2016; Stewart-Williams & Thomas, 2013).

Evolutionary psychologists have overwhelmingly examined human mating psychology as if reproductive interactions were hermetically sealed off from non-reproductive ones (e.g., Buss, 2013; Davies & Shackelford, 2015; Fisher & Cox, 2011; Stockley & Campbell, 2013; Walters & Crawford, 1994), although some notable exceptions exist (N. W. Bailey & Zuk, 2009; Denes, Lannutti, & Bevan, 2015; Sagarin, Becker, Guadagno, Wilkinson, & Nicastle, 2012; Scherer, Akers, & Kolbe, 2013). This approach is understandable given that the vast majority of males and females are opposite-sex attracted, and thus most human sexual behaviour is heterosexual in nature (J. M. Bailey et al., 2016). However, theoretical lenses presuming heterosexual mating, or

exclusively heterosexual behaviour, fail to capture a more complex (and interesting) reality—reproductive and non-reproductive sex have developed and evolved in concert, with each reciprocally influencing the other (N. W. Bailey & Zuk, 2009; Vasey, 2006).

When males and females prefer the same sexual partners, who themselves behave in a bisexual manner, then *inter-sexual* mate competition can ensue (Vasey, Leca, et al., 2014). Anecdotal accounts of inter-sexual mate competition exist for four avian and 14 mammalian species, including humans (Vasey, Leca, et al., 2014). It seems likely that many potential examples of inter-sexual mate competition have gone completely unreported to date, because researchers lack any sort of theoretical framework for even *recognizing* the existence of such interactions, let alone interpreting them. Quantitative research indicates that inter-sexual mate competition frequently occurs in certain Japanese macaque (*Macaca fuscata*) populations (Vasey, 1998). Similarly, recent cross-cultural research demonstrates that inter-sexual mate competition can manifest at appreciable rates in humans (Chapter 2), with the incidence of such competition varying by cultural context.

In Euro-American contexts, inter-sexual mate competition between females and males for male sexual partners is rare and dismissed as trivial when it does occur (Chapter 2). This is because, in Euro-American cultures, bisexual behaviour is relatively uncommon in men (J. M. Bailey et al., 2016), and same-sex attracted males (i.e., “gay” cisgender men) engage in sexual interactions with one another. As such, gay men inhabit (largely) separate mating enclaves from heterosexual men and women.

Unlike Euro-American contexts, where male same-sex sexual interactions typically occur between two “gay” men (i.e., *homogendered* relationships) (J. M. Bailey et al., 2016), there are numerous cultures outside of Euro-America where cisgender men engage in same-sex behaviour

with a male partner who occupies a culturally recognized gender category that exists beyond the “man” or “woman” binary (i.e., *heterogendered* relationships) (Murray, 2000; Nanda, 2014; Whitam, 1997). For example, in Samoa and among the Istmo Zapotec of Oaxaca, Mexico, feminine males are recognized as members of a non-binary gender. In Samoa, such individuals are known as *fa'afafine*, and among the Istmo Zapotec they are known as *muxes* (Mirandé, 2016; Vasey & VanderLaan, 2016). In both locales, these feminine gender non-binary males report exclusive androphilia (i.e., sexual attraction to adult males), and frequently engage in sexual interactions with masculine men who report predominant sexual attraction to women (i.e., gynephilia) (Gómez, Semenyna, Court, & Vasey, 2017; Gómez Jiménez, Court, & Vasey, 2020; Mirandé, 2016; Petterson et al., 2015, 2016). The differential expression of male androphilia across cultures, and subsequent differences in gynephilic males' willingness to engage in homosexual (but *heterogendered*) sexual behaviour, explains why Samoan and Istmo Zapotec women report having experienced inter-sexual mate competition at drastically elevated rates (43% and 85% respectively) compared to Euro-American women (15%) (Chapter 2).

Beyond Samoa and the Istmo Zapotec, there are numerous cultures that exist outside of a Euro-American context in which androphilic males identify, and are recognized, as belonging to non-binary gender categories. Examples include the *bissu* of Sulawesi, the *hijra* of India, the *xanith* of Oman, and the *'yan dandu* of Nigeria (Murray, 2000). Based solely on gender-identity, gender-role enactment, and pattern of relationship formation (i.e., homogendered vs. heterogendered), it would appear that these gender non-binary males share little in common with Euro-American gay men. Despite these outward differences, both groups share deeper similarities that indicate they can (and should) be meaningfully compared. Specifically, both groups tend to display exclusive or near exclusive androphilia, exhibit reduced reproduction

(Vasey, Parker, & VanderLaan, 2014), display female-typical play preferences in childhood (Bartlett & Vasey, 2006; Gómez Jiménez, Court, et al., 2020) and occupational preferences in adulthood (Semenyna & Vasey, 2016), evidence elevated indicators of childhood separation anxiety (Gómez et al., 2017; Vasey, Vanderlaan, Gothreau, & Bartlett, 2011), and indicate little or no distress (i.e., dysphoria) regarding their genitals (Vasey & Bartlett, 2007; Whitam, 1987). More tellingly, gay men and feminine gender non-binary males both have a preponderance of older biological brothers (Gómez Jiménez, Semenyna, & Vasey, 2020b; Semenyna, VanderLaan, & Vasey, 2017), tend to come from larger families (Gómez Jiménez, Semenyna, et al., 2020a; Semenyna, Petterson, et al., 2017) and have more androphilic male relatives (Gómez et al., 2018; Semenyna, VanderLaan, Petterson, et al., 2017). Critically, gay men comprise between 2-5% of the male population in Euro-American countries (J. M. Bailey et al., 2016), which is similar to the population prevalence of Samoan *fa'afafine* (Semenyna, VanderLaan, Petterson, et al., 2017) as well as Istmo Zapotec *muxes* (Gómez et al., 2018). Collectively, this research evidence is consistent with the conclusion that the androphilia of gay men and feminine gender non-binary males stems from a common biological origin, with culture moderating the expression of the trait (for review see Semenyna, VanderLaan, Petterson, et al., 2017).

Importantly, the gender non-binary presentation prevalent outside of Euro-American cultures is likely to be the ancestral expression of male androphilia (VanderLaan et al., 2013). It is thus essential that studies aimed at understanding the evolution of mate competition include data from cultures where the ancestral form of male androphilia is expressed, which also tend to be cultures where gynephilic men display greater willingness to engage in sexual activity with feminine males (Fernández-Alemany & Murray, 2002; Petterson et al., 2020; Whitam, 1992). Given these conditions, inter-sexual mate competition between women and gender non-binary

males is more common. The present study sought to examine intra- and inter-sexual mate competition in two cultures where the latter is known to occur.

Inter-sexual mate competition in Samoa and the Istmo Zapotec was presented in Chapter 2, using narratives of mate competition interactions collected from women in these cultures. The present study reports additional data pertaining to women's intrasexual mate competition with rival women, allowing for novel analysis and insights. Because no previous work has compared the tactics employed during intrasexual mate competition to those employed during inter-sexual mate competition, the present study sought to understand whether participants respond similarly or dissimilarly to female and male rivals, and whether these rivals employed comparable tactics. During mate acquisition competition, we anticipate that participants and rivals will employ largely similar tactics aimed at enticing target men. Conversely, during mate-retention competition, we anticipate that participants will report mate-retention tactics (e.g., vigilance, bids to secure the relationship) regardless of whether the interloper is a rival woman or third-gender male. It is unclear, however, whether rival women will differ from rival feminine gender non-binary males in poaching-type behaviours, although it seems likely that both will direct their attention towards the target man, aiming to entice him with flirtatious direct contact and sexual inducements.

Material and Methods

Ethical Approval

All study measures were approved by the Human Subject Research Committee at the authors' University. A Samoan research visa was obtained from the Samoa Immigration Office with the support of the Samoan *Fa'afafine* Association. Canadian foreign nationals, and US Citizens, are permitted to conduct research in Mexico for a period of 180 days if they have a

valid passport (Consulado de Carrera de México en Toronto, 2020). In addition, however, we obtained a letter endorsing our research from the Office of the Municipal President in Juchitán de Zaragoza, Mexico. Our research was further endorsed by leaders of the *muxe* community in Juchitán. All participants signed informed consent forms before participation, and completed basic biodemographic measures including age, relationship status, and a 7-point Kinsey-style sexual orientation measure (Kinsey et al., 1948). Data on inter-sexual mate competition were presented in Chapter 2. The present Chapter details novel analysis of intrasexual mate competition tactics, as well as a comparison of intra- and inter-sexual mate competition interactions.

Participants

Participants in both Samoa and the Istmo Zapotec were recruited through a network sampling procedure that involved contacting initial participants, who then provide referrals to additional participants, and so on. Participants were compensated for their time with either 20 Samoan Tala (\$7 USD), or 100 Mexican Pesos (\$5 USD). Samoan women ($n = 128$) were interviewed on the island of Upolu in the Independent State of Samoa, a Polynesian island nation in the South Pacific. This included feasibility pilot interviews with 25 women who were asked if they had ever experienced inter-sexual mate competition, as well as 103 women who were asked about their experiences of both intra- and inter-sexual mate competition. The average age of the Samoan women was 33.96 years ($SD_{\text{age}} = 11.7$, range 19-70). Most women were in heterosexual relationships (26 dating, 89 married), although some ($n = 13$) were single. Nearly all women were exclusively heterosexual (Kinsey 0), although one woman was bisexual (Kinsey 3). We also interviewed Zapotec women ($n = 100$) in the Istmo region (Juchitán and Tehuantepec districts) of Oaxaca, Mexico. The average age of the Istmo Zapotec women was 32.55 years

($SD_{age} = 10.6$, range 18-70). Most were in heterosexual relationships (18 dating, 59 married), but some ($n = 23$) were single. Most were exclusively attracted to men ($n = 93$), but some were mostly heterosexual (Kinsey 1; $n = 6$) and one was bisexual (Kinsey 3).

Women were asked whether they had ever experienced a situation in which they and a *fa'afafine*, or *muxe* (depending on culture) simultaneously competed for the romantic/sexual attention of the same man. This could be in either the context of mate acquisition, or in mate-retention. Additionally, participants were asked if they had ever experienced a situation in which they and another woman were simultaneously interested in, and competed for, the romantic/sexual attention of the same man. Participants who answered in the affirmative were then asked to provide detailed information about how the interaction unfolded. All interviews were recorded with a digital audio recorder for later analysis. Interviews in Samoa were conducted in English and Samoan, and a Samoan speaking research assistant was present for immediate translation. All interviews in the Istmo Zapotec were conducted in Spanish.

Treatment of Data

All recounts of mate-competition interactions were transcribed and translated (when necessary), then coded by two independent raters using a psychometrically validated mate retention inventory taxonomy (see Appendix 1) (Brewer & Hamilton, 2014; Buss, 1988a, 1988b; Buss et al., 2008; Pham et al., 2014; Shackelford, Goetz, & Buss, 2005). Inter-rater reliability was high (Samoa: $92.86 \pm 4.23\%$ agreement, mean Cohen's $Kappa = .69$, $SD = .18$; Istmo Zapotec: $92.86 \pm 4.76\%$ agreement, mean Cohen's $Kappa = .69$, $SD = .18$) and disagreements were resolved via discussion between the raters until consensus was reached. Tactics were coded as either present or absent for each competitor. Cumulative frequencies were then calculated, and the presence/absence of each tactic compared between relevant categories of competitors using 2

X 2 contingency tables. Due to the large number of statistical comparisons presented in Tables 3.1–3.4, attempts were made to balance Type I and Type II errors by treating two-tailed Fisher’s Exact p -values (GraphPad, 2020) as significant only if they fell below $p = .005$ (Benjamin et al., 2018).

Results

Rates of Intra- and Inter-Sexual Mate Competition

As reported in Chapter 2, 43% (55/128) of Samoan women reported having engaged in inter-sexual mate competition for a man with a *fa’afafine* rival, yielding 51 inter-sexual mate competition events detailed enough for analysis. Among women asked about experiences of intrasexual mate competition, 57% (59/103) indicating that they had competed with a woman, although only 50 mate-retention events were detailed enough for analysis. The rates of intra- and inter-sexual mate competition in Samoa were comparable, and do not significantly differ ($P = .065$, *Fisher’s exact test*). Because Samoan women reported so few inter-sexual mate acquisition events ($n = 10$), and no instances of intrasexual mate acquisition, analysis of Samoan data is constrained to mate retention events involving a woman or *fa’afafine* mate-poacher.

Among women in the Istmo Zapotec, 85% (85/100) reported that they engaged in inter-sexual mate competition for a man with a *muxe* rival, yielding 30 mate acquisition and 78 mate retention events detailed enough for analysis. Most Istmo Zapotec women (92%) (92/100) also reported having engaged in some form of intrasexual mate competition, resulting in 53 mate acquisition and 87 mate retention events. Like in Samoa, the reported rates of intra- and inter-sexual mate competition in the Istmo Zapotec did not differ ($P = .183$, *Fisher’s exact test*). Data from the Istmo Zapotec allows for meaningful comparison of intra- and inter-sexual mate competition in both acquisition and retention contests involving women and *muxes*.

Samoa Data

Table 3.1 presents data for both inter- and intra-sexual mate competition in Samoa. As noted above, only data for mate poaching/retention interactions are reported. The first two columns of Table 3.1 report Samoan participants' behaviour in response to female versus *fa'afafine* interlopers. Overall, women's response to a rival involved directing the majority of their mate retention tactics toward their masculine male mate. Typically, this involved directing negative inducements toward their mate, as well as being vigilant against the advances of their rival. This pattern was true whether their rival was a woman or a *fa'afafine*, given that Samoan women evidenced no significant differences regarding their mate competition tactics during intra- as compared to inter-sexual mate competition.

The third and fourth columns in Table 3.1 compare the reported behaviour of female and *fa'afafine* rivals, which are remarkably similar. Individuals who made mate-poaching attempts focus most of their efforts on the target man, employing direct contact (flirting, etc.) as well as sexual inducements in a high number of competitive interactions. Only one significant difference emerged, such that rival *fa'afafine* reportedly engaged in more overall negative inducement tactics directed at participant women, although rates of these tactics were generally low.

During Samoan mate-retention competition, participants' behaviour was different from that of the interloper in both intrasexual (columns 1 vs 3) and inter-sexual (columns 2 vs 4) contests. Specifically, women reported engaging in more vigilance toward their partners, and more emotionally punitive behaviours, whereas both rival women and *fa'afafine* tended to employ positive inducements such as flirtatiousness, or sexual provocation.

Table 3.1

Mate Retention/Poaching Tactics in Samoa

	Participant Behaviour (% Reporting)		Competitor Behaviour (% Reported)	
	Woman Rival (<i>n</i> = 50)	<i>Fa'afafine</i> Rival (<i>n</i> = 41)	Woman (<i>n</i> = 50)	<i>Fa'afafine</i> (<i>n</i> = 41)
Target Manipulation	94	90.2	70*	92.7
Guarding	56	53.7	2*	12.2*
Direct Guarding	2	4.9	0	0
Vigilance	48	41.5	2*	4.9*
Concealment	6	14.6	0	4.9
Monopolize	6	7.3	0	4.9
Negative Inducements	76	70.7	4*	2.4*
Jealousy Induction	0	2.4	0	0
Punish Infidelity Threat	52	43.9	0*	0*
Emotional Manipulation	36	39.0	0*	0*
Commitment Manipulation	28	22.0	0*	0*
Derogate Competitor	8	2.4	4	2.4
Positive Inducements	23	24.4	68*	87.8*
Resource Display	0	4.9	10	26.8
Sexual Inducement	4	2.4	32*	46.3*
Appearance Enhancement	4	9.8	2	17.1
Love and Caring	14	12.2	8	7.3
Submission & Debasement	4	2.4	0	0
Direct Contact	4	4.9	34*	56.1*
Personality Advertisement	2	0	2	2.4
Gain Access	0	0	14	29.3*
Competitor Manipulation	46	34.1	18*	39.0
Signal Possession	32	24.4	18	26.8
Verbal Possession Signals	32	19.5	12	14.6
Physical Possession Signals	0	4.9	8	14.6
Possessive Ornamentation	0	0	0	0
Negative Inducements	40	19.5	2*	22.0
Derogate Target	6	0	0	4.9
Threatened Competitor	20	7.3	0*	9.8
Violence against Rival	10	4.9	0	9.8
Direct Action	10	14.6	2	7.3
Capitalize on Opportunity	0	0	26*	24.4*
Coalitional Strategy	46	31.7	2*	7.3
Strategy Matching	6	9.8	8	9.8

Note: An asterisk in the last two columns indicates a significant difference ($p < .005$) within competition types such that the competitors' behaviour differs from that of participants. Bold number indicates a significant difference ($p < .005$) between first two columns (participant response to female vs. *fa'afafine* rival), or the second two columns (female competitor vs. *fa'afafine* competitor behaviour).

Mate Acquisition in the Istmo Zapotec

Table 3.2 reports mate acquisition tactics in the Istmo Zapotec. No significant differences were found between participants' behaviour when engaging in intra- or inter-sexual mate competition (columns 1 and 2). Participants directed most behaviour at the target man. Typically, this involved direct contact with the target man and appearance enhancement, regardless of the sex of their competitor. Similarly, both female and *muxe* competitors directed their attention to the target man, using positive inducements such as flirtatious direct contact (columns 3 & 4). *Muxes* were significantly more likely to direct positive inducements, including sexual provocations, toward the target than were rival women. As predicted, all individuals in these mate acquisition interactions primarily sought to impress the target man with positive inducements, although *muxe* employed these tactics more vigorously.

Mate Retention in the Istmo Zapotec

Table 3.2 reports the frequency of tactics used during intra- and inter-sexual mate retention/poaching competition. Istmo Zapotec participants employed significantly more negative inducements towards their partner when competing against a female interloper (column 1) than they did when a *muxe* was attempting to poach their mate (column 2). Participants also reported significantly more vigilance over their mate, and more direct action (confrontation) of their rival, when competing against a female interloper. These differences may be due to the fact that 24.4% of female participants indicated that they did nothing in response to a *muxe* interloper, because they believed that their partners were exclusively interested in women.

The third and fourth columns of Table 3.3 compare the reported behaviours of female and *muxe* interlopers in mate retention competitions. *Muxe* interlopers were significantly more likely to employ positive inducements, including resource display and appearance enhancement.

Female interlopers were significantly more likely to attempt to gain access to the target man, as well as capitalize on opportunities to interact with him. These subtle differences are overshadowed by broad similarities, such that all interlopers, regardless of whether they were women or *muxes*, tended to use positive inducements directed at the target man, including flirting, sexual inducements, and emphasizing love/caring.

Within Istmo Zapotec mate-retention competitive interactions, participants' behaviour tended to reliably differ from that of the interloper, regardless of whether the retention competition was intrasexual (columns 1 vs 3), or inter-sexual (columns 2 vs 4) in nature. The interloper would typically employ tactics meant to entice the target man in some way, and participants responded, in turn, by vigilantly watching their partner and employing tactics of negative inducement meant to secure their relationship.

Discussion

The present study sought to compare the tactics employed during intrasexual mate competition between female participants and female rivals, to the tactics employed during inter-sexual mate competition events, wherein women engaged in mate competition against feminine, gender non-binary males for the romantic/sexual attention of the same target man. In both Samoa and the Istmo Zapotec, the likelihood that women had ever experienced intrasexual mate competition against a woman was comparable to having engaged in inter-sexual mate competition against a rival *fa'afafine* or *muxe*. This is not to say that intra- and inter-sexual mate competition occur at identical rates in these cultures, as the vast majority of mate competition in both cultures is still likely to be intrasexual. Such a finding simply highlights the fact that inter-sexual mate competition is a regular occurrence in these cultures and is embedded within the broader heterosexual mating landscape.

Table 3.2

Mate Acquisition Tactics in the Istmo Zapotec

	Participant Behaviour (% Reporting)		Competitor Behaviour (% Reported)	
	Woman Rival (n = 53)	Muxe Rival (n = 30)	Woman (n = 53)	Muxe (n = 30)
Target Manipulation	75.5	80.0	81.1	96.7
Guarding	18.9	16.7	20.8	20
Direct Guarding	1.9	0	0	3.3
Vigilance	11.3	10.0	7.5	6.7
Concealment	3.8	6.7	0	3.3
Monopolize	3.8	0	9.4	10.0
Negative Inducements	26.4	36.7	22.6	26.7
Jealousy Induction	5.7	0	0	0
Punish Infidelity Threat	5.7	6.7	3.8	0
Emotional Manipulation	17.0	16.7	5.7	3.3
Commitment Manipulation	7.5	10.0	3.8	3.3
Derogate Competitor	1.9	13.3	11.3	26.7
Positive Inducements	66.0	63.3	66.0	93.3*
Resource Display	0	3.3	3.8	20.0
Sexual Inducement	3.8	6.7	3.8	23.3
Appearance Enhancement	39.6	23.3	11.3*	13.3
Love and Caring	24.5	36.7	9.4	33.3
Submission & Debasement	1.9	3.3	0	0
Direct Contact	37.7	46.7	54.7	76.7
Personality Advertisement	3.8	6.7	1.9	0
Gain Access	28.3	30.0	30.2	23.3
Competitor Manipulation	37.7	46.7	52.8	66.7
Signal Possession	22.6	26.7	26.4	46.7
Verbal Possession Signals	22.6	26.7	26.4	43.3
Physical Possession Signals	1.9	0	0	3.3
Possessive Ornamentation	0	0	0	0
Negative Inducements	24.5	33.3	35.8	46.7
Derogate Target	0	3.3	1.9	6.7
Threatened Competitor	5.7	3.3	17.0	10.0
Violence against Rival	1.9	0	0	0
Direct Action	17.0	26.7	18.9	40.0
Capitalize on Opportunity	5.7	3.3	15.1	6.7
Coalitional Strategy	9.4	10.0	7.5	6.7
Strategy Matching	13.2	20.0	9.4	20.0

Note: An asterisk in the last two columns indicates a significant difference ($p < .005$) within competition types such that the competitors' behaviour differs from that of participants. Bold number indicates a significant difference ($p < .005$) between first two columns (participant response to female vs. *muxe* rival), or the second two columns (female competitor vs. *muxe* competitor behaviour).

Table 3.3

Mate Retention/Poaching Tactics in the Istmo Zapotec

	Participant Behaviour (% Reporting)		Competitor Behaviour (% Reported)	
	Woman Rival (<i>n</i> = 87)	<i>Muxe</i> Rival (<i>n</i> = 78)	Woman (<i>n</i> = 87)	<i>Muxe</i> (<i>n</i> = 78)
Target Manipulation	96.6	66.7	83.9	96.2*
Guarding	54.0	33.3	3.4*	2.6*
Direct Guarding	0	3.8	2.3	1.3
Vigilance	48.3	23.1	0*	0*
Concealment	16.1	9.0	0*	0
Monopolize	2.3	3.8	1.1	2.6
Negative Inducements	93.1	60.3	17.2*	10.3*
Jealousy Induction	0	0	0	1.3
Punish Infidelity Threat	80.5	43.6	0*	0*
Emotional Manipulation	50.6	23.1	2.3*	0*
Commitment Manipulation	39.1	14.1	0*	0*
Derogate Competitor	4.6	6.4	16.1	10.3
Positive Inducements	10.3	5.1	81.6*	94.9*
Resource Display	0	0	3.4	23.1*
Sexual Inducement	2.3	1.3	29.9*	43.6*
Appearance Enhancement	1.1	1.3	4.6	15.4*
Love and Caring	8.0	2.6	26.4*	34.6*
Submission & Debasement	1.1	0	1.1	1.3
Direct Contact	3.4	2.6	47.1*	62.8*
Personality Advertisement	0	0	2.3	1.3
Gain Access	0	1.3	51.7*	35.9*
Competitor Manipulation	44.8	35.9	20.7*	32.1
Signal Possession	13.8	24.4	5.7	16.7
Verbal Possession Signals	10.3	20.5	2.3	15.4
Physical Possession Signals	3.4	3.8	4.6	1.28
Possessive Ornamentation	0	0	0	0
Negative Inducements	40.2	17.9	18.4*	24.4
Derogate Target	4.6	0	1.1	0
Threatened Competitor	10.3	6.4	6.9	2.6
Violence against Rival	1.1	3.8	1.1	0
Direct Action	28.7	10.3	12.6	23.1
Capitalize on Opportunity	2.3	1.3	39.1*	21.8*
Coalitional Strategy	14.9	3.8	0	0
Strategy Matching	3.4	3.8	0	2.6

Note: An asterisk in last the two columns indicates a significant difference ($p < .005$) within competition types such that the competitors' behaviour differs from that of participants. Bold number indicates a significant difference ($p < .005$) between first two columns (participant response to female vs. *muxe* rival), or the second two columns (female competitor vs. *muxe* competitor behaviour).

The features of mate acquisition competitions could only be analyzed among the Istmo Zapotec, where interviews yielded a sufficient number of such events. As predicted, all individuals in these contests directed the majority of their behaviour towards the target man, seeking to gain his attention by engaging in flirtatious behaviour. A few significant differences emerged in mate-acquisition stories, *muxe*s employed more positive inducements overall, including sexual inducements toward target men. This is not to say that competitors did not engage in mate-acquisition tactics directed at their rivals, as a sizeable minority of competitors tried to lay claim to the target man by signaling possession, or directing negative inducements toward their competitor during direct confrontations.

Comparison of tactics employed during intra- and inter-sexual mate retention competitions showed that participant women in both cultures used largely comparable tactics. That is, both Samoan and Istmo Zapotec women directed most behaviours toward their male partner, engaging in guarding and emotionally punitive tactics meant to secure the relationship. This was true whether the attempted mate poacher was a woman, or a feminine gender non-binary male. While this pattern characterized the Istmo Zapotec, participants from this culture nonetheless reported somewhat muted reactions toward *muxe* interlopers as compared to rival women, given that many participants believed their male partners would be entirely disinterested in sexual interactions with *muxe*s. As such, it is difficult to interpret whether participants' somewhat differential response was because *muxe* were not seen as genuine competitors, or if *muxe*'s behaviour itself incited an altered behavioural riposte. Furthermore, *muxe*s vary in their relative femininity/masculinity and gendered presentation (Gómez Jiménez, Court, et al., 2020), and it is possible that women who did nothing in response to a *muxe* mate-poacher did so because *muxe*s in those interactions presented in a relatively more masculine fashion. Because

the mate poaching behaviours of rival women and *muxes* were largely analogous (see below), it is most likely that participant's idle response was driven by their beliefs about the situation and their partner's sexual preferences more so than the tactics employed by their rival.

The behaviour of attempted mate-poachers was largely comparable across gender and culture, with both women and feminine gender non-binary males attempting to gain access to the target man by enticing him with flirtation (direct contact), or sexual inducements. In Samoa, numerous participants communicated qualitatively that *fa'afafine* often competed more intensely and provocatively than rival women, but no differences were found to be significant in the present data. It is possible this represents type-II error given that the smaller number of mate competition stories obtained in Samoa lowers statistical power. In the Istmo Zapotec, the behaviours of both female and *muxe* mate-poachers were substantially similar. However, *muxes* were more likely overall to employ positive inducements, including resource display (which is male-typical) (Buss, 1988a, 1988b; Buss et al., 2008), whereas women were more likely to engage in attempts to gain access to the target man or capitalize on fortuitous opportunities to interact with him in the absence of his female partner. The former difference is consistent with qualitative documentation that some *muxe* entice masculine men with gifts of clothing, food/alcohol, or even money, in exchange for sex (Mirandé, 2017). The latter difference could be due to female's general tendency to engage in social and competitive tactics that reduce the likelihood of direct confrontation with rivals (Björkqvist, 1994; Campbell, 2013, 2016), and women may be especially reluctant to confront a feminine gender non-binary male rival who is nonetheless sex-typical in size and strength. Furthermore, numerous participants indicated that *muxes* were able to be flirtatious and sexually provocative in ways that would receive social opprobrium if displayed by a woman.

The overall pattern of results shows that participants report employing similar tactics in both intra- and inter-sexual mate competition episodes. In mate acquisition contests, the behaviour of women and gender non-binary males is largely akin, with all competitors attempting to attract and impress the target man. The overall pattern of mate-retention competition was largely similar in both intra- and inter-sexual contests as well, with participant women describing cost-inflicting behaviour toward their partner (e.g., punish threat of infidelity, emotional manipulation), whereas both female and male interlopers directed benefit provisioning behaviours at the target man (e.g., direct contact), as has been found in other research (Buss et al., 2008; Shackelford et al., 2005). It is likely that women have long faced inter-sexual mate competition, because the ancestral form of male androphilia is the feminine expression (VanderLaan et al., 2013). However, this has not produced a unique cognitive/behavioural response (*sensu* Tooby & Cosmides, 1992), and it appears that women's intrasexual mate competition tactics are simply coopted and applied to situations involving inter-sexual mate competition. In addition to this insight, the present study adds valuable data regarding the cross-cultural utility of mate-competition taxonomies derived from Euro-American samples (Buss, 1988a, 1988b; Fisher & Cox, 2011; Walters & Crawford, 1994), as well as confirmation that many of the tactics employed by Euro-American women in mate acquisition and mate retention are likewise employed by women in the distinct cultures of Samoa and the Istmo Zapotec.

Several limitations must be noted about the present study. First, neither sample was representative, and thus cannot inform conclusive prevalence estimates of any specific type of mate competition. Second, the narratives used for documenting the features of inter-sexual mate competition were one-sided, with women reporting on their own behaviour as well as that of their competitors. This undoubtedly impacted our results, given human tendencies to overstate

their positive attributes, and downplay behaviours and traits that are more negative (Blasberg, Rogers, & Paulhus, 2014). Because the present study focused on behaviour during mate competition, it seems especially likely that participants would cast their own behaviour in a favorable light, and that of their opponents as less so. Third, the qualitative analysis and coding of mate-competition narratives also necessitated the loss of important contextual information, and many of the subtleties of the mate-competition interactions. The true events on which participant narratives were based were undoubtedly richer in detail than our interviews captured. Additionally, many of the extant nuances that were relayed in mate-competition stories were further simplified by the qualitative coding scheme that dichotomized the presence or absence of tactics, but did not quantify their intensity.

Despite these limitations, and the preliminary nature of our results, the current study is promising. Our results indicate that within two disparate cultures, a comparable proportion of women have experienced intra- and inter-sexual mate competition. This illustrates that the presence of feminine third-gender males, in combination with gynephilic men's willingness to engage in sexual interactions with them (Peterson et al., 2020), noticeably alters the mating landscape. Furthermore, inter-sexual mate competition shares much in common with intrasexual mate competition. Not only do reproductive and non-reproductive behaviours evolve and develop in concert (N. W. Bailey & Zuk, 2009; Vasey, 2006), so too does intra- and inter-sexual mate competition. We hope that the present study alerts researchers to the existence of inter-sexual mate competition among humans (and non-human species), fomenting refinements to sexual selection based theoretical frameworks, and motivating further empirical documentation and investigation of this phenomenon.

Chapter 4: Women's Reaction to Opposite- and Same-Sex Infidelity in Three Cultures: Data from Canada, Samoa, and the Istmo Zapotec

Abstract

Previous research indicates that Euro-American women are more upset by imagining their male partners committing homosexual infidelities than heterosexual ones. The present studies sought to replicate these findings, and extend them to two non-Western cultures wherein masculine men frequently engage in sexual interactions with feminine third-gender males. Across six studies in three cultural locales (Canada, Samoa, and the Istmo Zapotec), women were asked to rate their degree of upset when imagining that their partner committed infidelity that was heterosexual in nature, as well as infidelity that was homosexual in nature. In two Canadian undergraduate samples, women reported greater upset at imagining partner infidelity with a woman, whereas a community sample of middle-aged women reported equal upset across infidelity types. Samoan women reported substantially lower upset at the thought of partner infidelity with a third-gender male (*fa'afafine*) as compared to a woman. Istmo Zapotec women reported equal upset toward infidelity with a woman or a third gender male (*muxe*), whereas a second Zapotec sample reported slightly greater upset at the thought of infidelity with a *muxe*. Results illustrate how cultural contexts moderate the degree to which same-sex infidelity scenarios are upsetting to women.

Keywords: infidelity; cross-cultural research; inter-sexual mate competition

Introduction

Infidelity in romantic relationships is a widespread phenomenon (Druckerman, 2007) and one that is prevalent, occurring in an estimated 20-25% of marriages in Euro-American countries (Fincham & May, 2017). Broadly construed, two types of infidelity have received most attention from researchers. Emotional infidelity involves forming a deep, inter-personally intimate (but not sexual) bond with someone other than your romantic partner. Sexual infidelity involves engaging in extra-dyadic sexual activity and does not inherently involve the formation of deeper emotional intimacy. There is robust evidence that within both sexes, men and women tend to choose emotional infidelity as more distressing than sexual infidelity (see Carpenter, 2011). However, comparisons between the sexes show that a higher proportion of men than women find sexual infidelity most distressing, whereas more women than men report greatest upset in response to emotional infidelity (e.g., Edlund & Sagarin, 2017; Harris, 2003; Sagarin, Martin, et al., 2012). This sex difference holds cross-culturally, extending to cultures outside of Euro-America (Scelza et al., 2019).

The reproductive threat-based model (RTBM) has been used to explain sex differences in reactions to sexual and emotional infidelity (Sagarin, Becker, et al., 2012). Rooted in parental investment theory (Trivers, 1972), the RTBM proposes that in heterosexual pairings, men will show most concern when their female partners engage in extra-dyadic sexual behaviour that poses a conception risk. In contrast, the model predicts that women will show greatest concern when their male partners engage in behaviours that could be indicative of abandonment and, by extension, the loss of male provisioning of resources. The vast majority of past studies have (understandably) examined reactions to heterosexual infidelity. A much smaller literature has examined reactions to homosexual infidelity (e.g., Confer & Cloud, 2011; Sagarin, Becker, et

al., 2012; Wiederman & LaMar, 1998). In this article, we focus on women's reactions to heterosexual and homosexual infidelity.

One of the first studies of this kind examined a sample of mid-Western American undergraduates, finding that heterosexual women were more upset by the thought of their male partner engaging in a homosexual infidelity, than a heterosexual one (Wiederman & LaMar, 1998). The authors speculated that this effect could be due to concerns that same-sex contact on the part of their male partner indicated an enduring, but hidden, sexual preference. If so, a woman would not be able to offer what her partner presumably desired, and would therefore stand no chance of competing successfully. Replication studies, with subtle variations on methodology, have also explored Euro-American women's reaction to infidelity involving opposite- or same-sex sexual behaviour. Some studies have indicated that women are more upset by the thought of homosexual infidelity (Brewer, 2014; Confer & Cloud, 2011; Franks, 2015). Others have indicated the contrary, with women reporting either equal (Hughes, Harrison, & Gallup, 2004) or greater upset over infidelities that are heterosexual in nature (Denes et al., 2015; Sagarin, Becker, Guadagno, Nicastle, & Millevoi, 2003).

In light of these mixed results, it is presently unclear whether women from Euro-American countries are more distressed by infidelities that are heterosexual or homosexual in nature. While political conservatism seems to moderate women's distress over homosexual infidelity (Franks, 2015), factors such as negative attitudes towards homosexuality do not (e.g., Brewer, 2014). The strength of women's reaction to homosexual infidelities may be moderated by their beliefs about what homosexual infidelities *mean* (Denes et al., 2015), in particular the attributions women make about what such behaviour means about their partner's sexual preferences.

Here, we examine women's reactions to heterosexual and homosexual infidelity in three distinct cultures, including Canada, Samoa, and the Istmo Zapotec. In line with the RTBM, we predicted that Canadian women would report more emotional upset in response to their male partners' infidelity with another man compared to infidelity with a woman (see also Denes et al., 2015). Although such infidelity does not represent a conception risk, male bisexuality is relatively rare in Euro-American cultures (Gates, 2011). As such, a man's sexual interest in another male is strongly predictive of an exclusively homosexual orientation. In these types of cultures, it is typical for exclusively homosexual (gay) men to prefer romantic and sexual partnerships with other gay men. Consequently, homosexual infidelity carries with it a risk of abandonment that is even more extreme than that which is associated with heterosexual infidelities. It is conceivable that a woman could compete effectively in the latter context, but they would have negligible ability to do so, if any at all, in the former context.

Outside of Euro-American cultural contexts, what homosexual infidelity means may differ substantially, and by extension, so too will women's reactions to these events. For example, there are numerous cultures in which males who are androphilic (i.e., sexually attracted to adult males) behave in a relatively feminine manner (i.e., they would be labeled as "transgender" from a Western perspective). These individuals are identified by themselves and others as belonging to non-binary gender categories—neither men, nor women. Examples include Samoan *fa'afafine* and Istmo Zapotec *muxes* (Gómez et al., 2017; Mirandé, 2016; Vasey & VanderLaan, 2014, 2016), although numerous other examples exist (Murray, 2000; Whitam, 1997). In such cultures, it is commonplace for gender non-binary males to engage in sexual activity with masculine (cisgender) males who identify as men and who are mostly gynephilic (i.e., they are sexually attracted to adult females) (Whitam, 1992, 1997; Whitam & Mathy, 1986). In line with

the RTBM, we predicted that Samoan and Istmo Zapotec women would report less emotional upset in response to their male partners' infidelity with a gender non-binary male compared to infidelity with a woman. The reasons for this prediction are twofold. Like in Euro-American cultures, same-sex infidelity does not represent a conception risk. Unlike Euro-American cultures, it is common for men to engage in sexual activity with *fa'afafine* or *muxes*, and most of these men prefer women as sexual partners (Mirandé, 2017; Petterson et al., 2020). As such, it is likely that Samoan and Istmo Zapotec women perceive infidelities with gender non-binary males as fleeting peccadillos, following which their partners will quickly return to them. In contrast, we predicted that infidelities with women will elicit relatively more distress, among Samoan and Istmo Zapotec women, because these interactions are both reproductive threats and much more indicative of possible abandonment.

Overall Method

All study measures were approved by the University of Lethbridge Human Subject Research Committee. A research visa was obtained from the Samoan Immigration Office with the support of the Samoan *Fa'afafine* Association. In Mexico, Canadian foreigner nationals, and US Citizens, are permitted to conduct research for a period of 180 days if they have a valid passport (Consulado de Carrera de México en Toronto, 2020). In addition, however, we obtain a letter endorsing our research from the Office of the Municipal President in Juchitán, Mexico.

All participants were Canadian, Samoan, or Istmo Zapotec women. All participants signed informed consent forms prior to participating in the study and completed basic biodemographic measures including age and relationship status. Participants also completed a 7-point Kinsey-style sexual orientation measure, which ranged from 0 (exclusive sexual attraction to men) to 6 (exclusive sexual attraction to women) (Kinsey et al., 1948).

Unless otherwise stated, all participants responded to questions about their degree of upset in hypothetical infidelity scenarios involving a male partner having a one-time sexual encounter with either a woman, or a male (see Studies 2, 3, and 6, for small variations in methodology). Culturally appropriate terminology was applied to the gender identity of the male (i.e., “gay man” in Canada, “*fa’afafine*” in Samoa, “*muxe*” in the Istmo Zapotec). The term *upset* was used rather than *jealous* in order to avoid value-laden responses from participants, and to be consistent with Wiederman and LaMar (1998). Samoan and Istmo Zapotec women were interviewed using identical questionnaire measures, which had been translated and back-translated by two Samoan- or Spanish-speaking research assistants. Participants rated their degree of upset on a 9-point Likert-style scale anchored by 1 = *Not at all upset*, and 9 = *Extremely upset*. Due to the skewed nature of participants’ upset over infidelity in these and other data, non-parametric comparisons were employed for all samples. In addition to ratings of degree of upset, which are susceptible to ceiling effects, participants also answered a forced-choice question indicating whether they would be more upset if their male partner had a one-time sexual encounter that was opposite- or same-sex in nature. Forced-choice question responses were analyzed using binomial sign tests, which compared the proportion of individuals that selected each option against a model assuming both response options were equally likely (i.e., $p = 0.50$). The rating scale questions were presented in randomized order, and participants answered the forced-choice question last. Due to the large number of statistical comparisons, as well as concerns over replicability of novel research (Ioannidis, 2005), critical alpha followed the suggestions of Benjamin et al. (2018), such that statistical tests with p -values between .05 and .005 were treated as suggestive, whereas p -values that were below this threshold ($p < .005$) were treated as significant.

Study 1: Canadian Undergraduate Sample from one University

The first Canadian sample was comprised of 187 undergraduate women who completed online study measures in exchange for course credit in the Psychology department of the University of Lethbridge (Canada). Forty-one participants were excluded, including 19 participants who failed to complete all relevant measures, 17 women who indicated that they had either predominant sexual attraction to women (\geq Kinsey 3) or were dating women, and 5 individuals failing an attention check question (i.e., “Please select option 4 for this question”). The retained sample ($n = 146$) was young ($M_{\text{age}} = 19.66$ years, $SD_{\text{age}} = 1.82$ years, range: 17–30), and predominantly Caucasian (80.1%). The majority of women ($n = 134$) were in committed heterosexual romantic relationships, for a median duration of 1 year. Most women (98) indicated exclusive sexual attraction to men (Kinsey 0), with 40 individuals identifying as Kinsey 1, and 8 as Kinsey 2.

Results: Study 1

The mean and standard deviation of women’s degree of upset are reported in Table 4.1, with forced choice proportions reported in Table 4.3. Within-subjects comparisons showed that women reported significantly more upset when imagining their male partner having a one time-sexual encounter with another woman, and this difference was associated with a moderate effect size ($d = .42$). The same pattern emerged in the forced choice paradigm, with 84.2% (123/146) of women choosing infidelity with a woman as being worse than infidelity with a man.

Study 2: Canadian Undergraduate Sample from two Universities

The second Canadian sample was comprised of 833 undergraduate women from two Mid-Western Canadian Universities (University of Lethbridge and MacEwan University) who completed study measures in exchange for course credit in 2017 and 2018. These women were

participants in an un-related personality study (Semenyna, Vasey, & Honey, in preparation), who were shown relevant questions only if their demographic characteristics fit our inclusion criteria. Specifically, participants who indicated that they were biological females, identified as women, had Kinsey scores ≤ 3 , and were in a committed romantic relationship with a man, were randomly assigned to answer one of three questions about infidelity. This question appeared immediately after the demographic questions (sex, age, relationship status, Kinsey, ethnicity, etc.), but before any personality measures. Rather than making within-participant comparisons of women's upset as well as forced-choice response, participants only answered one of the possible questions. Among this sample, 280 women rated their degree of upset at imagining their partner having a single sexual encounter with another woman, whereas 299 women rated their degree of upset at imagining their partner having a single sexual encounter with a gay man. A third group of 254 women responded to the forced choice question.

Groups did not differ by age ($F(2, 830) = .814, p = .443$), and the overall sample reported a mean age of 20.96 years ($SD_{age} = 4.26$, Range: 17–49). The majority of Study 2 participants were Caucasian (78.3%), and heterosexual, with 527 women reporting Kinsey 0, 247 reporting Kinsey 1, 45 as Kinsey 2, and 14 as Kinsey 3.

Results: Study 2

Between group comparisons are reported in Table 4.1, and the forced choice proportions are reported in Table 4.3. Women who rated their degree of upset in response to opposite-sex infidelity reported significantly more upset than women who rated their degree of upset to same-sex infidelity, and this difference was associated with a large effect size ($d = .88$). The participants responding to the forced-choice question mirrored the patterns found in Study 1,

with 85.0% of women choosing opposite-sex infidelity as being more upsetting than same-sex infidelity.

Study 3: Canadian Community Sample

A third community Sample was recruited in 2019 from a pub and eatery in the working-class, industrial district of a small city in Southern Alberta, Canada (population ~100,000). This population was targeted in order to recruit a sample that was closer in age to those drawn from Samoa and the Istmo Zapotec (see below), as well as avoid possible response bias among current undergraduate students eager to avoid appearing homophobic. Recruitment of participants was achieved via coordination with female staff, who asked female patrons if they would be willing to participate in a research study in exchange for a small monetary gift (\$5 CAD). Participants who gave incoherent responses, or who were deemed inebriated by the researchers had their responses discarded ($n = 2$). The community sample included data from 62 women, with a mean age of 46.5 years ($SD_{\text{age}} = 11.95$, range = 21–70). This sample size is capable of detecting within-participant effects of $d \geq .35$ at 80% power (Faul, Erdfelder, Lang, & Buchner, 2007). The median education level for these women was a college diploma or equivalent, with a median yearly income of \$50,000–75,000 CAD (~\$38,000–57,000USD). Nearly all of these women were in relationships with men (89%), with a median length of 10 years or more. Most of the women were Caucasian (92%), and heterosexual (69%), with 11 women identifying as Kinsey 1, 5 women as Kinsey 2, and 3 women as Kinsey 3.

Using the same 9-point Likert style scale described above, women reported how upset they would be if their boyfriend/husband had a one-time sexual encounter with another (1) woman, (2) man, and (3) a transgender woman (i.e., a biological male who identifies and looks like a woman). For the forced choice questions, women had to select which scenario would be

most upsetting, contrasting the choice of (4) a woman vs. a man, (5) a woman vs. a transgender woman, and (6) a transgender woman vs. a man. These additional questions were added in order to allow for clearer comparisons between women's responses imagining their partners' infidelity with a woman as compared to a third-gender male. Although *fa'afafine* and *muxe* are different in many respects from Western transgender women, their gender-presentation and feminine identity are nonetheless more comparable than that of gay men and *fa'afafine/muxe*.

Results: Study 3

Women's rating of upset in response to various infidelity scenarios are reported in Table 4.2, with forced-choice proportions reported in Table 4.3. Unlike Studies 1 and 2, within-subjects comparisons revealed that women in the Canadian community sample did not differ in their degree of upset towards imagining their partner engaging in a one-time sexual encounter with another woman, another man, or a transgender woman. Similarly, although women chose infidelity with a woman as being more upsetting than infidelity with either a gay man or a transgender woman (Table 4.3), these differences were not significantly different from 50%. Additionally, 39.7% of women reported that infidelity with a man would be worse, compared to 60.3% saying infidelity with a transgender woman would be worse, which did not differ from chance using a binomial sign test, $z = -1.58, p = .148$ (2-tailed).

Study 4: Samoan Sample

Samoan women ($n = 113$) were recruited using a network sampling procedure in 2017. This involved contacting initial participants, who are asked for referrals to other potential participants, who themselves gave further referrals. Participants were given 20 Samoan *tala* (\$7 USD) in exchange for their participation. The average age of Samoan women was 33.96 years ($SD_{age} = 11.7$, range: 19–70). The median (and modal) education level was completion of high

school, with 23% of the sample having at least some post-secondary education. All participants reporting sexual attractions of Kinsey 0 in the last year, and all women were currently in romantic relationships (25 dating, 88 married).

Results: Study 4

Within-subject comparisons showed that Samoan women reported significantly more upset at the thought of their boyfriends/husbands having a one-time sexual encounter with another woman, as compared to with a *fa'afafine* (Table 4.1). This difference was associated with a large effect size ($d = 1.49$), and was corroborated in the forced-choice question, where 94.7% of women (107/113) chose sexual infidelity with a woman as being more upsetting than sexual infidelity with a *fa'afafine*.

Study 5: Istmo Zapotec Sample

Data for study 5 were collected from Istmo Zapotec women in 2016 using a network sampling procedure identical to that employed in Samoa. Participants were compensated for their time with 100 Mexican Pesos (\$5USD). The final sample consisted of Zapotec women ($n = 101$) living in the Istmo region (Juchitán and Tehuantepec districts) of Oaxaca state, Mexico. The average age of Istmo Zapotec women was 32.92 years ($SD_{\text{age}} = 10.9$, range: 18–70), and the median education level was completion of high school, with 29% of women reporting a post-secondary education. The majority of participants were exclusively heterosexual, with 94 participants responding as Kinsey 0, 6 reporting Kinsey 1, and 1 individual identifying as a Kinsey 3. The majority of Istmo Zapotec women were currently in romantic relationships with men (18 dating, 59 married), and 24 women were single at the time of interview.

Results: Study 5

Within subject comparisons of participant upset are reported in Table 4.1. Unlike Samoa, and the Canadian undergraduate samples, Istmo Zapotec women did not significantly differ in their degree of upset towards infidelity that was opposite-sex or same-sex in nature. The forced-choice paradigm, however, did reveal a significant difference, with only 29.7% of respondents selecting infidelity with a woman as more upsetting, whereas 70.3% reported that infidelity with a *muxe* would be more upsetting (Table 4.3).

Study 6: Istmo Zapotec Sample Differentiating two *Muxe* Types

Under the broader category of *muxe*, Istmo Zapotec recognize two subtypes: *muxe gunaa* and *muxe nguiiu* (i.e., Zapotec for “*muxe* woman” and “*muxe* man,” respectively). *Muxe gunaa* are similar to the Samoan *fa’afafine*—transgender androphilic males who present publicly in a relatively feminine manner. *Muxe nguiiu* are more similar to Western gay men, meaning they are cisgender androphilic males who present publicly in a relatively masculine manner. Both *muxe* types are more feminine than Istmo Zapotec men, although *muxe gunaa* are much more so than *muxe nguiiu* (Gómez Jiménez, Court, et al., 2020). Both types of *muxes* are attracted to masculine men as sexual partners, most of whom appear to be gynephilic, preferring sexual activity with women (Miano Borruso, 2001; Mirandé, 2016). *Muxe nguiiu* also view one another as viable sexual partners, but not *muxe gunaa*.

The methodology employed in Study 5 did not specify whether the *muxe* involved in the hypothetical scenario was more feminine (i.e., *muxe gunaa*) or masculine (i.e., *muxe nguiiu*). As such, a second Istmo Zapotec sample ($n = 162$) was recruited in a subsequent fieldtrip in 2018. Data were collected following an identical procedure to that described in Study 5. The average age of women in the second Istmo Zapotec sample was 36.15 years ($SD_{\text{age}} = 11.20$, range: 19–

62), with a median high school education (36.4% of women reported a bachelor's degree or higher). The majority of the participants were exclusively heterosexual, with 155 participants responding as Kinsey 0, 3 reporting Kinsey 1, 3 individuals reporting Kinsey 2, and one woman as Kinsey 3. Most Istmo Zapotec women in this sample were currently in romantic relationships with men (64 dating, 93 married), and 5 women were single at the time of interview.

Women in this Istmo Zapotec sample responded to three questions measuring their degree of upset to the imagined infidelity of a boyfriend/husband, as well as three forced-choice questions. Using the same 9-point Likert style scale described above, women reported how upset they would be if their boyfriend/husband had a one-time sexual encounter with another (1) woman, (2) *muxe gunaa*, and (3) a *muxe nguiiu*. For the forced choice questions, women had to select which scenario would be most upsetting, contrasting the choice of (4) a woman vs. a *muxe nguiiu*, (5) a woman vs. a *muxe gunaa*, and (6) a *muxe nguiiu* vs. a *muxe gunaa*.

Results: Study 6

Istmo Zapotec women's ratings of their degree of upset towards various infidelity scenarios are reported in Table 4.2. An omnibus Friedman Test revealed that women's degree of upset differed across the three ratings of infidelity. Follow-up pairwise Wilcoxon's tests showed that women reported greater upset towards the thought of their boyfriend/husband having a one-time sexual encounter with both *muxe gunaa* and a *muxe nguiiu* as compared to their degree of upset to a sexual encounter with another woman (both $p = .004$). The degree of upset towards the two *muxe* types did not significantly differ ($p = .596$).

Table 4.1

Comparison of Women's Rating of Upset to Heterosexual vs. Homosexual Infidelity in Three Cultures

	<i>n</i>	Woman		Male		Wilcoxon Test		Effect Size $r = z/(n)^{1/2}$	Effect Size Cohen's <i>d</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	Statistic (<i>z</i>)	<i>p</i>		
Study 1: Canada	146	8.50	1.08	7.91	1.69	4.89	< .001	.40	0.42
Study 2: Canada	579	8.56	1.08	6.85	2.52	10.02 ^a	< .001	.42	0.88
Study 4: Samoa	113	8.62	1.33	4.57	3.60	7.163	< .001	.62	1.49
Study 5: Istmo Zapotec	101	7.94	1.86	8.18	1.67	-1.18	.239	-.12	-0.14

Note: Reported *p*-values are 2-tailed. Ratings ranged from 1 (not at upset) to 9 (extremely upset). Due to the skewed nature of the data, Cohen's *d* effect sizes should be interpreted with caution. Effect size interpretations are as follows: $r = .1$ small, $.3$ medium, $.5$ large; $d = .2$ small, $.5$ medium, and $.8$ large (Cohen, 1988; Fritz, Morris, & Richler, 2012).

^a Study 2 involved random assignment of women to rate their imagined upset at partner infidelity with either a woman ($n = 281$), or a man ($n = 300$). As such, a Mann-Whitney *U* test was employed for this between-group comparison.

Table 4.2

Comparison of Women's Rating of Upset to Infidelity with a Woman, Transgender Male, and Cisgender Male.

Sample	<i>n</i>	Woman		Transgender Male		Cisgender Male		Friedman Test		Effect Size		Effect Size
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	χ^2 (<i>df</i> = 2)	<i>p</i>	$r = z/(n)^{1/2}$		Cohen's <i>d</i>
Study 3: Canada	62	8.26	1.33	8.11	1.88	8.06	1.84	0.03	.987	-.10, -.13, .05		.09, .12, .03
Study 6: Istmo Zapotec	162	7.97 ^a	1.72	8.35 ^b	1.43	8.40 ^b	1.37	18.00	< .001	-.23, -.23, .04		-.24, -.27, -.03

Note: Reported *p*-values are two-tailed. Ratings ranged from 1 (not at upset) to 9 (extremely upset). Different superscript indicates significant differences indicated by follow-up pairwise comparisons using Wilcoxon's test, with $p \leq .005$. All effect size estimates are listed in order of comparing upset about infidelity with a woman vs. with a transgender male, infidelity with a woman vs. with a cisgender male, and infidelity with a transgender male vs. with a cisgender male.

Table 4.3

Proportion of Women Choosing Heterosexual or Homosexual Infidelity as More Upsetting in Forced Choice Paradigm

Sample	Infidelity with a woman is worse	Infidelity with male is worse	Binomial Sign Test Statistic ^b	<i>p</i> -value (2-tailed)
Canada: Study 1 (<i>n</i> = 146)	84.2%	15.8%	<i>z</i> = 8.28	<i>p</i> < .001
Canada: Study 2 (<i>n</i> = 254)	85.0%	15.0%	<i>z</i> = 11.17	<i>p</i> < .001
Canada: Study 3 (<i>n</i> = 58) ^a				
Woman vs. Gay Man	60.3%	39.7%	<i>z</i> = 1.58	<i>p</i> = .148
Woman vs. Trans W	57.9%	42.1%	<i>z</i> = 1.31	<i>p</i> = .289
Samoa: Study 4 (<i>n</i> = 113)	94.7%	5.3%	<i>z</i> = 9.50	<i>p</i> < .001
Zapotec: Study 5 (<i>n</i> = 101)	29.7%	70.3%	<i>z</i> = -4.08	<i>p</i> < .001
Zapotec: Study 6 (<i>n</i> = 163)				
Woman vs. <i>Muxe Nguiiu</i>	21.0%	79.0%	<i>z</i> = -7.39	<i>p</i> < .001
Woman vs. <i>Muxe Gunaa</i>	28.4%	71.6%	<i>z</i> = -5.50	<i>p</i> < .001

^a 4 women in this sample refused to answer the forced choice question, or circled multiple answers. As such, this comparison only pertains to the 58 women who chose a response.

^b Binomial Sign tests produce exact *p*-values. However, *z*-scores were estimated using the binomial approximation, $z = \frac{x - np}{\sqrt{np(1-p)}}$, where *x* = the number of participants who selected heterosexual infidelity as being worse, *n* = sample size, and *p* = 0.50.

Forced choice ratings displayed a similar pattern, with 71.6% of women choosing infidelity with a *muxe gunaa* as more upsetting than infidelity with a woman (Table 4.3), and 79.0% of women choosing infidelity with a *muxe nguiiu* as more upsetting than infidelity with a woman. In addition to data reported in Table 4.3, 64.8% of women reported that infidelity with a *muxe nguiiu* would be more upsetting than infidelity with a *muxe gunaa*, which significantly differs from an equal proportion using a binomial sign test, $z = 3.77, p < .001$.

Discussion

The present series of studies sought to examine women's reaction to hypothetical sexual infidelities that were heterosexual or homosexual nature. Data were collected in three distinct cultures: Canada, Samoa, and the Istmo Zapotec of southern Mexico. Using both continuous rating scales and forced choice questions, women in all three cultures were asked to imagine their degree of upset in response to their male partner engaging in infidelities with another female or male, as well as select which of the two would be more upsetting. It was predicted that Canadian women would be more distressed by homosexual infidelities than those with women. This is because male bisexuality is rare in Euro-American cultures (Gates, 2011), and women largely inhabit different mating enclaves than gay men. As such, if a woman's partner engaged in homosexual infidelity, such behaviour could be indicative of an altered or hidden categorical preference for other men. Faced with such a situation, women would have virtually no competitive leverage. The opposite pattern was predicted in Samoa and the Istmo Zapotec, given that androphilic males in these cultures regularly adopt more feminine identities and take masculine men as sexual partners, making bisexual behaviour much more commonplace in these locales. Most of these men are predominantly gynephilic (Mirandé, 2017; Petterson et al., 2020). Consequently, women in these cultures are more likely to view homosexual infidelity as transient

indiscretions following which, their boyfriends or husbands will quickly return to them. On this basis, we predicted that these same women would be much more distressed by heterosexual infidelity with its concomitant risk of conception and, by extension, loss of male provisioning. Of our three main predictions, only the prediction for Samoa was supported.

Data from Canada were composed of three separate studies. Study 1 employed a convenience sample of undergraduate women. Although both heterosexual and homosexual infidelity were rated as highly distressing, within-subjects comparisons revealed greater upset to heterosexual infidelity. Study 2 employed a second convenience sample of undergraduate women, with participants randomly assigned to rate either their degree of upset to heterosexual infidelity, their degree of upset to homosexual infidelity, or to answer the forced choice question about which infidelity type would be more distressing. This approach was employed in order to lessen the impact of socially desirable responding by young women eager to avoid appearing homophobic. Study 2 replicated the patterns of Study 1, with both rating scales and forced choice comparisons showing that women were more distressed by heterosexual infidelity. Such a pattern is similar to some past findings (Denes et al., 2015; Sagarin et al., 2003), but unlike others where women reported homosexual infidelity as most distressing (Brewer, 2014; Confer & Cloud, 2011; Franks, 2015; Wiederman & LaMar, 1998). The present findings are interpretable using the Reproductive Threat Based Model (RTBM) (Sagarin, Becker, et al., 2012), given that only heterosexual infidelities represent a risk of conception and loss of resources. Furthermore, societal attitudes towards non-heterosexual behaviour have become more positive in recent years, particularly among young adults (Fetner, 2016). As such, it is possible that young Canadian women in our sample perceived homosexual infidelities as

“experimentation” or simply exploring sexuality, whereas heterosexual infidelities more strongly activated jealous reactions.

With respect to Study 3, the Canadian community sample, recruited from a pub and eatery in a working-class industrial sector of a small city, showed a somewhat different pattern from the undergraduate samples. On both rating scales and forced choice questions, these older women did not differ in their degree of upset over heterosexual or homosexual infidelity. This held whether the homosexual infidelity was imagined to be with a gay man or an MtF trans woman. This pattern is similar to findings among a sample of undergraduate women from the North-East United States, who were equally distressed by heterosexual and homosexual infidelity (Hughes et al., 2004). It is possible that the pattern of results among older Canadian women differed from their younger compatriots in part because of documented generational differences in tolerance towards homosexuality (Andersen & Fetner, 2008; Twenge & Blake, 2020). However, because these studies show that the impact of attitude change across time outweighs inter-generational differences in tolerance, and currently tolerance is high in an absolute sense, we favour an alternate interpretation. Given that the majority of participants were past reproductive age, were in long-term committed relationships (10+ years or more), and people in Western contexts generally view infidelity in disastrous terms (Druckerman, 2007), it is possible that infidelity of any sort provoked strong jealous reactions in these women. In support of this interpretation, numerous participants spontaneously offered their reasoning for their choices, with statements such as “cheating is cheating, I don’t care who it’s with.”

Regarding Study 4, data from Samoa were consistent with our predictions, and women overwhelmingly reported that heterosexual infidelity with a woman was more upsetting to them than if their partner had a (homosexual) one-night stand with a *fa’afafine*. This finding makes

sense in light of both the RTBM, as well as women's beliefs about what sexual behaviour with a *fa'afafine* indicates about men's sexuality. Samoan women were far less perturbed by the thought of their husbands or boyfriends engaging in sexual interactions with *fa'afafine*. One woman, whose individual responses matched closely the averages reported, offered her reasoning: "With the woman I'll slap her face...With a woman, one might turn into another and another." This same woman's perspective was drastically different when it came to infidelity with a *fa'afafine*, saying "I don't mind because the man goes and comes back." Another Samoan woman, who laughed when asked about infidelity with a *fa'afafine*, simply stated, "I would just say go shower before you come to bed." These unprompted responses from Samoan women make clear that the presence of *fa'afafine* in Samoa, and the widespread sexual behaviour between *fa'afafine* and gynephilic men (Pettersen et al., 2020), impact women's perception of homosexual infidelity.

Unlike Samoans, and counter to our predictions, continuous rating scales indicated that women in the Istmo Zapotec were either equally distressed by infidelity with a woman and a *muxe* (Study 5), or slightly *more* distressed by infidelity with a *muxe* (Study 6). The forced choice questions revealed that the significant majority of Istmo Zapotec women in both samples chose infidelity with a *muxe* as more distressing. Study 6 showed that whether the imagined infidelity occurred with a feminine *muxe gunaa* or more masculine *muxe nguiiu*, Istmo Zapotec women found both of these possibilities more distressing than infidelity with a woman. Because infidelity with *muxe* poses no conception risk, such a pattern does not strictly conform to the predictions of the RTBM, but is informed by women's interpretation of what such behaviour might mean about their partner's sexuality (Denes et al., 2015). Several comments made by participants explaining their choices shed light on the observed patterns. One woman succinctly

captured the two most frequently cited reasons that infidelity with a *muxe* was perceived as more distressing:

I would be more upset if my partner had a sexual encounter with a *muxe* because he'd be more likely to catch a sexually transmitted disease. Also, if he has sex with a *muxe*, it means that he's also a *muxe*, and that he's being lying about his sexual preferences all along.

Worry about sexually transmitted infection between men and *muxe* has been documented elsewhere (Finkler, 2008; Miano Borruso, 2001), and presented as a salient concern among many of our current participants. Indeed, the state of Oaxaca has an HIV rate many times higher than the national average (Bautista-Arredondo, Colchero, Romero, Conde-Glez, & Sosa-Rubi, 2013), and *muxe* in particular have come under scrutiny because they are perceived by the public as being carriers of HIV (see Finkler, 2008; Miano Borruso, 2001). Furthermore, men's sexual behaviour with *muxe* was taken by many women to indicate concealed sexual preferences or identity, a perception that was absent in Samoa. It is possible that the existence of two types of *muxe* play into these beliefs. In Samoa, *fa'afafine* show variability in their degree of femininity, but nonetheless form a single group wherein most *fa'afafine* are unambiguously more feminine than men (Bartlett & Vasey, 2006). Among the Istmo Zapotec, however, *muxe nguiiu* are more similar in appearance to gay men than the more feminine *muxe gunaa*, who have a decidedly more feminine presentation akin to the *fa'afafine* (Gómez Jiménez, Court, et al., 2020). This cultural difference means that it is possible to be an unremarkably masculine individual and still be androphilic, which could in turn colour women's perception of what infidelity with a *muxe* means for their partner's sexual interests. Indeed, women's greater (forced choice) upset at the thought of infidelity with a masculine *muxe nguiiu* compared to a *muxe gunaa*, speaks to the plausibility of this interpretation.

Sexual jealousy can be seen as an affective adaptation that would motivate individuals to respond to relevant mating threats. One might therefore predict that jealousy in response to homosexual infidelities would promote inter-sexual mate competition between women and androphilic males, particularly in cultures where the potential for such infidelity is elevated and the perceived threat is higher. Indeed, research indicates that inter-sexual mate competition occurs most commonly among the Istmo Zapotec and least commonly in Canada, with Samoa falling somewhere in the middle (Chapter 2).

Limitations

There are a number of important limitations to note in the present study. Like other studies of jealousy, emotional reactions to infidelity are subject to ceiling effects which produce highly skewed data. In order to circumvent this issue, we employed both forced choice questions, and continuous rating scales analyzed with non-parametric statistics.

As with most psychological research, we employed non-random sampling for all of our studies. It is thus unclear how well our results generalize to Canadian, Samoan, or Istmo Zapotec women more broadly. A comparison of Studies 1 and 2 with Study 3, demonstrates that within-culture generational differences may exist.

The largest limitation is the lack of systematic information about why cultures differ so widely in their perception of homosexual infidelity. In the future, it will be important to address this issue by asking women about their beliefs surrounding the (im)mutability of men's sexual orientation. In addition to this, we cannot be sure that reaction to heterosexual or homosexual infidelity evoked emotional responses for the same *reasons*, even when they were similar in intensity. Consequently, our explanations of the cross-cultural patterns we detected are post-hoc and speculative.

Some readers may be curious why cross-cultural comparisons were not undertaken. Our main research question concerned reactions to homosexual infidelity vis-à-vis heterosexual infidelity within the same culture. A priori predictions pertained to the differences within each culture, rather than differences between them. Nonetheless, an inspection of Table 4.1 shows that women were much less variable in their response to heterosexual infidelity than to homosexual infidelity. This suggests stronger stabilizing selection of women's reactions to heterosexual infidelity regardless of cultural context.

A final concern pertains to whether or not it is appropriate to compare infidelity with gay men (Canada) to infidelity with third-gender males (Samoa and the Istmo Zapotec). From a biopsychological perspective, this comparison is certainly appropriate. Whether a woman imagines her partner engaging in a sexual interaction with a gay man, a *fa'afafine*, or a *muxe*, this represents sexual interaction between two biological males. From a cultural perspective, the comparisons are somewhat discordant, given that homosexual infidelity in the Euro-America involves a sexual interaction that is *homogendered* (i.e., both parties are "men"), whereas homosexual infidelity in Samoa and the Istmo Zapotec involves a sexual interaction that is *heterogendered* (i.e., one party is a "man" and the other identifies as a non-binary gender). These concerns notwithstanding, we contend that such comparisons are both warranted and informative. Both gay men and gender non-binary males, like *fa'afafine* and *muxes*, rarely father children, are much more likely to have androphilic male relatives, prefer female-typical games and play-partners as children and stereotypically feminine occupations as adults, tend to have a greater number of older brothers, and respond to visual stimuli in a similar manner (Pettersen et al., 2018; Semenyna, VanderLaan, Pettersen, et al., 2017; Vasey & VanderLaan, 2014). Most importantly, the prevalence of third-gender males in both Samoa (Semenyna, VanderLaan,

Petterson, et al., 2017), and the Istmo Zapotec (Gómez et al., 2018) is between 2–6%. This prevalence rate is consistent with that of gay men in Euro-American cultures (J. M. Bailey et al., 2016), and is considerably larger than the 0.5% prevalence rate that has been reported for transgender MtF individuals in Euro-American nations (Gates, 2011). For these reasons, there is ample psychological and biodemographic evidence that Western gay men and non-Western third-gender males represent culturally differentiated expressions of the same underlying trait—male androphilia.

Conclusion

This series of six studies gives cross-cultural insight into women's perceptions of homosexual and heterosexual infidelity. Collectively, these data illustrate the powerful ways in which culture can moderate women's reaction to infidelities that are homosexual in nature. In Samoa, women were considerably less upset about the thought of their partner having a sexual interaction with a *fa'afafine* as opposed to another woman. Canadian undergraduates showed a similar pattern, although the difference was much more muted. Older, Canadian women in a community sample showed equal distress over homosexual and heterosexual infidelity. Similarly, Istmo Zapotec women showed either equal, or more distress, at the thought of their partners engaging sexually with *muxe*. Differential reactions to homosexual infidelity across cultures seem to be driven by variation regarding what such behaviour means. The contrasting reactions of Samoan and Zapotec women to homosexual infidelity indicates that existence of third-gender males does not invariably result in the same social reactions to these males in the mating-market.

Chapter 5: Testing Women's Trust in Other Women and Same-Sex Attracted Males in Three Cultures

Abstract

Heterosexual women trust mating-relevant advice received from gay men more than that received from heterosexual women. This trust is predicated on women's perception that gay men lack ulterior sexual motives and romantically pursue other gay men. However, this trust may not hold in all cultures. For example, in both Samoa and the Istmo Zapotec of Southern Mexico, women take part in mate-competition against feminine same-sex attracted males—referred to as *fa'afafine* and *muxe* respectively—who regularly engage in sexual activity with masculine men. The present studies sought to replicate and extend research on women's trust in males who are same-sex attracted. Experiments were conducted in Canada, Samoa, and the Istmo Zapotec, with women randomly assigned to consider the likelihood of various mate-poaching behaviours performed by either a rival woman, or a same-sex attracted male. In Canada, women were more trusting of cisgender gay men than other women. Similarly, Samoan women were more trusting of *fa'afafine* than other women. In the Istmo Zapotec, women were equally distrustful of women and feminine *muxe gunaa*, whereas more masculine *muxe nguiiu* were rated as more trustworthy than women and *muxe gunaa*. These results illustrate that women's trust in same-sex attracted males varies both between and within cultural contexts, perhaps impacted by the relative femininity of the male in question.

Keywords: male androphilia; inter-sexual mate competition; cross-cultural research

Introduction

Humans devote enormous amounts of time to acquiring and retaining mates (Buss, 1988a, 1988b; Buss & Schmitt, 2019; Buss & Shackelford, 1997). In doing so, they employ a large number of individual mate competition tactics, such as emphasizing beauty, status, or desirable personality traits (Buss, 1988a, 1988b; Buss & Shackelford, 1997; Fisher & Cox, 2011; Walters & Crawford, 1994), but also regularly engage in coalitional strategies to acquire and maintain mates (Pham, Barbaro, Mogilski, & Shackelford, 2015; Pham et al., 2014). However, such coalitions can be risky. Coalitions with individuals of the same sex can be compromised by mutual interest in a target, leading to the possibility of misdirection, sabotage, or mate-poaching (e.g., Fisher & Cox, 2011). Coalitions with opposite sex individuals may be confounded by ulterior motives, with ostensibly platonic friendships used to gain sexual access (Haselton & Galperin, 2013; Russell, Babcock, Lewis, Ta, & Ickes, 2018). This latter possibility is of particular concern for women, given heterosexual men's greater tendency to (mis)perceive innocuous cues as conveying sexual interest or intent (Lindgren, 2008; Wegner & Abbey, 2016), and men's tendency to over-perceive romantic/sexual interest in the context of friendships with women (Bleske-Rechek et al., 2012). Concern over intrasexual mate competition, and the pitfalls of coalitional friendships with heterosexual men, likely push many women into coalitions with individuals perceived to be devoid of these concerns—gay men.

Traditionally, evolutionary psychologists have isolated reproductive mating (i.e., heterosexual behaviour and pairing) from sexual interactions that are non-reproductive (i.e., homosexual behaviour and pairing) (e.g., Buss, 2013; Campbell, 2013; Davies & Shackelford, 2015; Fisher & Cox, 2011; Schmitt, 2015; Sommer & Vasey, 2006; Walters & Crawford, 1994). Same-sex attraction and behaviour have been viewed primarily as an evolutionary puzzle to be

solved, rather than an important piece *within* the broader mating market (N. W. Bailey & Zuk, 2009; Vasey, 2006). Emerging research in humans has begun to challenge this absolute demarcation between reproductive and non-reproductive behaviour, acknowledging the possibility of same-sex infidelity (e.g., Confer & Cloud, 2011; Wiederman & LaMar, 1998), some individuals' heightened attraction to bisexual partners (Apostolou, Shialos, Khalil, & Paschali, 2017; Apostolou, Wang, & O, 2018), and even heterosexual women's greater trust in relationship advice received from gay men as compared to other women (Russell et al., 2013; 2017).

Close friendships and trust between women and gay men have been qualitatively documented (de la Cruz & Dolby, 2008; Grigoriou, 2004; Hopcke & Rafaty, 1999). Both qualitative and experimental evidence shows that heterosexual women prefer the help and fashion advice of gay men in retail settings (Rosenbaum, Russell, & Russell-Burnett, 2017; Russell, Bradshaw, Rosenbaum, Hill, & Russell-Bennett, 2019). Experimental laboratory settings show that women display more comfort (e.g., open body posture and positive affect) when a male confederate divulges being homosexual as opposed to heterosexual (Russell, Ickes, & Ta, 2018). Experimental research has shown that heterosexual women place more trust in advice received from a gay man than from a woman (Russell et al., 2013). A replication of this finding demonstrated that this trust was especially true for mating-relevant advice (Russell et al., 2017). Women often form friendships with gay men precisely because such friendships are unlikely to involve deceptive mating advice or ulterior sexual motives (Russell, Ickes, et al., 2018). Contrary to the suggestion that women's friendships with gay men are motivated by poor body image or low levels of attractiveness, women's body-esteem and perceived sexual attractiveness are positively correlated with the number of gay friends she has (Bartlett,

Patterson, VanderLaan, & Vasey). Indeed, one study found that women's independently rated physical attractiveness was positively correlated with their motivation to befriend gay men, a relationship that existed because these women placed greater trust in the advice of gay men and did not believe such friendships were impinged by either sexual interest or competition for mates (Russell, Babcock, et al., 2018).

Research examining women's trust in gay men represents a rare departure from the traditional approach to human heterosexual mating psychology, because it treats homosexual males as active players in the heterosexual mating arena, impacting the mating psychology and behaviour of heterosexual women. Women's trust in gay men makes sense if one assumes that heterosexual women seek out heterosexual men as romantic/sexual partners and gay men seek out other gay men. As such, women and gay men draw from pools of potential mates that do not overlap. On the other hand, this assumption fails to ring entirely true, given that both heterosexual women and gay men are sexually interested in men (i.e., both are androphilic).

Research on women's trust in androphilic males has been conducted entirely in Euro-American populations. In Euro-American societies, gay men represent the most common form of male androphilia (i.e., attraction and arousal to adult men). Gay men tend to behave in a relatively masculine manner and are typically identified as "men" by themselves and others (i.e., they are cisgender in terms of gender role presentation and identity). Because the identity category of "gay" is culturally and historically situated (Murray, 2000; Nanda, 2014; Norton, 1997; Whitam, 1997), translating research on gay men to other times and places outside of those that are Western, educated, industrialized, rich, and democratic (i.e., WEIRD) (Henrich, Heine, & Norenzayan, 2010) can be far from seamless.

In numerous countries outside of Euro-America, androphilic males routinely adopt a relatively feminine gender role presentation, and identify as belonging to non-binary gender categories (Murray, 2000; Nanda, 2014; Norton, 1997; Vasey & VanderLaan, 2014; Whitam, 1997). Examples of these gender non-binary males include the *bissu* of Sulawesi, the *hijra* of India, the *xanith* of Oman, the *muxes* of Istmo region of Mexico, the *'yan dandu* of Nigeria, and the *fa'afafine* of Samoa (Murray, 2000). All of these would likely be identified as *transgender* from a Western perspective. Non-Western, gender non-binary males are almost always exclusively androphilic. Ethnographic exceptions to this pattern are exceedingly rare (e.g., Basilov, 1978).

More than a decade of empirical research has demonstrated that Western gay men and non-Western gender non-binary males share numerous bio-demographic and psychological correlates, including elevated childhood femininity and separation anxiety (Gómez et al., 2017; Gómez Jiménez, Court, et al., 2020; VanderLaan, Petterson, & Vasey, 2017), female-typical occupational preferences (Semenyna & Vasey, 2016), similar viewing time patterns of male and female stimuli (Petterson et al., 2018), a greater number of androphilic male relatives (Gómez et al., 2018; Semenyna, VanderLaan, Petterson, et al., 2017), a larger number of biological older brothers (Gómez Jiménez, Semenyna, et al., 2020b; Semenyna, VanderLaan, & Vasey, 2017; but see Skorska et al., 2020), and, most importantly, a prevalence rate of 2-6% among males (Gómez et al., 2018; Semenyna, VanderLaan, Petterson, et al., 2017). These similarities are consistent with the conclusion that the same biologically based trait (male androphilia) can be expressed in different ways depending on cultural context in which it develops. In Euro-American societies, most androphilic males grow up to be cisgender (gay) men. In numerous non-Western societies,

the same proportion of males are androphilic (i.e., 2-6%), but grow up to be transgender, adopting non-binary gender identities and expressing a feminine gender role.

Unlike gay men, gender non-binary males do not engage in sexual activity with each other. Instead, they take masculine male sexual partners who self-identify, and are identified by others, as “men” (Murray, 2000). The majority of these masculine men prefer women as sexual partners (i.e., they are gynephilic), but engage in non-trivial amounts of sexual behaviour with gender non-binary males (Pettersson et al., 2020; Whitam, 1992). Research in Samoa has shown that the male partners of *fa’afafine* are “mostly gynephilic” (i.e., Kinsey 1). That is, these men’s subjective sexual attraction and objective viewing time to male and female stimuli is shifted in a relatively bisexual direction compared to men who engage in sexual activity only with women (Pettersson et al., 2015, 2016). In non-Western cultures where gender non-binary males engage in mate competition with women for masculine men, this creates mating market realities that are strikingly different than those studied in Euro-American contexts, likely reducing women’s trust in androphilic males.

In the present study, data were collected in Canada, Samoa, and among the Istmo Zapotec. In Canada, we sought to test, and thereby replicate, whether women were more trusting of gay men than they are of other women. We tested this same research question in Samoa and among the Istmo Zapotec of southern Mexico, two cultures where androphilic, gender non-binary males (*fa’afafine* and *muxes*, respectively) engage in mate competition with women for masculine men (Chapter 2). Women in Samoa and the Istmo Zapotec report that it is more common for them to defend their mates from poaching attempts of *muxe* or *fa’afafine* (Chapter 2) than it is to compete with gender non-binary males in acquiring a mate. As such, the present study focused on hypothetical scenarios where women would be vulnerable to mate poaching. It

was predicted that in Canada, women would report greater levels of trust in a gay man who is interacting alone with their romantic partner than when a woman was interacting alone with their romantic partner. Alternatively, it was predicted that in Samoa and the Istmo Zapotec, women's (mis)trust in androphilic males (*fa'afafine* and *muxes*, respectively) and women would either be closer in magnitude, or show no difference.

The presence of two types of *muxe* among the Istmo Zapotec allows for within-culture comparisons of women's trust in relatively feminine males (*muxe gunaa*) who are similar to *fa'afafine* versus those that are relatively masculine (*muxe nguiiu*) and thus, somewhat akin to Euro-American gay men (Gómez et al., 2017). Given that the average Istmo Zapotec man prefers feminine sexual partners over masculine ones, we predicted that Zapotec women will display greater trust in *muxe nguiiu* than toward potential female rivals. In contrast, we predicted that the more feminine *muxe gunaa*, would be perceived by women as either equally or more untrustworthy than rival women.

Method

All study measures and procedures were approved by the Human Subject Research Committee at the authors' institution. Samoan data were collected under a research visa obtained from the Samoan Immigration Office, with the support of the Samoan *Fa'afafine* Association. Canadian foreign nationals, and US Citizens, are permitted to conduct research in Mexico for a period of 180 days if they have a valid passport (Consulado de Carrera de México en Toronto, 2020). In addition, however, we obtained a letter endorsing our research from the Office of the Municipal President in Juchitán, Mexico.

All participants signed informed consent forms before participation. Following this, all participants completed basic biodemographic measures including age, relationship status, and a

7-point Kinsey-style sexual orientation measure (Kinsey et al., 1948) in addition to undertaking the study itself. Sexual attraction ratings ranged from the Kinsey scale ranged from 0 (exclusive sexual attraction to men) to 6 (exclusive sexual attraction to women). To participate in the study, participants had to meet several pre-screening criteria, including reporting their biological sex as female, currently being in a committed romantic relationship with a man, and passing attention check questions related to the experimental task.

Participants

An a priori Power analysis (Faul et al., 2007), using medium effect sizes ($\sim d = .50$) found in prior research (Russell et al., 2013; 2017), indicated that each experimental group required 50 or more participants to have adequate power ($\beta \geq 80\%$). Canadian data collection continued for two full semesters, and data collection in Samoa (August/September 2017) and the Istmo Zapotec (November/December 2018) occurred for the duration of field visits.

The Canadian sample was comprised of undergraduate women ($n = 281$) who accessed online study measures in exchange for course credit in the psychology department of a small university on the Canadian prairies. The present Canadian sample represents the control group in a larger experimental study of Canadian women's trust in gay men (see Chapter 6). Canadian women were young, with a mean age of 20.53 years ($SD_{\text{age}} = 3.48$ years, range: 17–49), and were predominantly Caucasian (79.4%). Women's romantic relationships were a median duration of 1–2 years of length. Most women (166) indicated exclusive sexual attraction to men (Kinsey 0), with 97 individuals identifying as Kinsey 1, 11 as Kinsey 2, and seven as Kinsey 3.

Samoan women ($n = 212$) were recruited using a network sampling procedure. This involves contacting initial participants, who are asked for referrals to other potential participants, who themselves gave further referrals. A Samoan research assistant was present during data

collection to provide instructions to all participants and to answer questions. Participants were given 20 Samoan tala (\$7 USD) to thank them for their participation. Samoan participants completed the study measures using paper and pencil. Samoan questionnaires were translated and back-translated by two Samoan-speaking research assistants.

The average age of Samoan women was 35.72 years ($SD_{age} = 12.05$ years, range: 18–78). The median (and modal) education level was completion of high school, with 23% of the sample having at least some post-secondary education. One woman was excluded for reporting predominant sexual attraction to women (Kinsey 5). Most participants reported sexual attractions of Kinsey 0 (97.2%), with five women reporting predominant sexual arousal to men but an occasional fantasy about a woman (Kinsey 1). All women were currently in romantic relationships with men (63 dating, 149 married) for a median duration of 2-5 years and a modal duration of 5 years or more.

Data were collected from Istmo Zapotec women ($n = 165$) using a network sampling procedure identical to that used in Samoa. Participants were given 100 Mexican Pesos (\$5 USD) to compensate them for their participation. One woman was excluded for inconsistent responding, as well as 5 women not currently in relationships, and 2 women reporting predominant sexual attraction to women (Kinsey ≥ 4). The final sample consisted of women living in the Istmo region of Oaxaca, Mexico ($n = 157$), primarily in the city of Juchitán de Zaragoza and outlying rural areas of the Juchitán and Tehuantepec districts. Istmo Zapotec participants completed the study measures using paper and pencil. Spanish questionnaires were translated and back-translated by the second author and a Spanish-speaking research assistant.

The average age of Zapotec women was 36.06 years ($SD_{age} = 11.17$, range: 19–62), and the median education level was completion of high school, with 35.7% of women reporting a

post-secondary education. Most of the participants were exclusively heterosexual, with 151 participants responding as Kinsey 0, and six women reporting Kinsey scores between 1 and 3. All Zapotec women retained for analysis were currently in romantic relationships with men (64 dating, 93 married).

Materials and Procedure

After completing biodemographic questions, women in all cultures considered the following scenario: “Imagine that you and your boyfriend/husband have recently been invited to a party. It is the night of the party and you become ill. However, a [woman] **OR** [category of androphilic male] who is your neighbour offers to go to the party with your boyfriend. This person is 25 years of age and single.” In Canada, women were randomly assigned to conditions where their neighbour was either a heterosexual woman, or a gay man. In Samoa, women were randomly assigned to conditions where the neighbour was either a woman or a *fa’afafine*. In the Istmo Zapotec, women were randomly assigned to conditions where the neighbour was either a woman, a *muxe gunaa*, or a *muxe nguiiu*. Following the presentation of this scenario, women were asked to rate 9 questions pertaining to the trustworthiness of this neighbour, evaluating the likelihood that the neighbour would engage in various mate-poaching behaviours (*Mate Retention Trust Questionnaire*). Questions were modelled after Russell et al. (2013; 2017), and include items such as “How likely is it that the neighbour would flirt with your boyfriend/husband at the party?” and “How likely do you think it is that you would warn your boyfriend to not trust the intentions of the neighbour?” (see Appendix 2 for full list of questions). Women rated each question on a 7-point Likert scale ranging from 1 = *Very unlikely* to 7 = *Very likely*, with higher scores representing greater mistrust. This scale showed high reliability in Canadian ($\alpha = .91$), Samoan ($\alpha = .91$), and the Istmo Zapotec ($\alpha = .83$) samples. Additionally, at

the end of each survey, an attention check question asked participants to identify the sexual preference of the neighbour with whom their boyfriend attended the part to verify that they accurately perceived the individual as attracted to men. Individuals who indicated that the neighbour was predominantly attracted to women were excluded, which removed 67 women from the Canadian sample (not included in the above reported sample size). No women in the retained Samoan or Zapotec samples failed this task. This difference is likely due to the fact that Canadian women completed all measures online, increasing the likelihood of careless responding, whereas Samoan and Zapotec women completed paper and pencil measures in the presence of researchers and research assistants.

Analyses

All comparisons were conducted within, rather than between culture. There are two reasons for this choice. First, our hypotheses pertain specifically to women's trust in androphilic males vis-à-vis their trust in women in their own culture. Second, there are numerous local ecological factors that impact women's general levels of competition such as sex-ratio, social standing, and group norms (e.g., Barber, 2000, 2003; Campbell, 2013, 2016; de Jong et al., 2012; Stockley & Campbell, 2013; Weir et al., 2011), none of which were presently measured. As such, direct cross-cultural comparisons are less informative for the present hypotheses than relative comparisons within each cultural locale.

Results

Women's mistrust scores were significantly skewed in all cultures. Canadian women's mean mistrust showed a significant positive skew, Shapiro-Wilk = 0.957, $df = 281$, $p < .001$. Conversely, women's mean mistrust in Samoa (Shapiro-Wilk = 0.879, $df = 212$, $p < .001$) and the Istmo Zapotec (Shapiro-Wilk = 0.914, $df = 157$, $p < .001$) showed significant negative skew.

As such, non-parametric comparisons (Mann-Whitney U tests) were employed for pairwise comparisons within each sample. Due to concerns over replicability of novel research (Ioannidis, 2005), critical alpha was adjusted such that statistical tests with p -values between .05 and .005 were treated as “suggestive,” whereas p -values that were below this threshold ($p < .005$) were treated as significant (Benjamin et al., 2018).

All statistical results are reported in Table 5.1. Among Canadian women, 142 women were randomly assigned to rate their trust in a female neighbour, and 139 to rate their trust in a gay man. Women in the female neighbour condition reported significantly greater mistrust. This difference was associated with a moderate effect size, Cohen’s $r = .33$, Cohen’s $d = 0.67$ (95% CI [0.38, 0.95]). In Samoa, 106 women were assigned to each condition. Samoan women reported significantly greater mistrust in women than toward *fa’afafine*. This difference was associated with a moderate effect size, Cohen’s $r = .35$, Cohen’s $d = 0.63$ (95% CI [0.36, 0.91]). In the Istmo Zapotec, 53 women rated their mistrust in a female neighbour, 51 rated their mistrust in a *muxe gunaa* neighbour, and 53 rated their mistrust in a *muxe nguiiu* neighbour. A Kruskal Wallis test revealed overall group differences among the three conditions, $\chi^2(2, N = 157) = 14.43, p = .001$. Follow-up pairwise Mann-Whitney U comparisons showed that women’s mistrust of a rival woman and *muxe gunaa* did not significantly differ ($p = 0.195$). However, women reported significantly greater mistrust in a woman as compared to a *muxe nguiiu*, with the difference associated with a moderate effect size, Cohen’s $r = .36$, Cohen’s $d = 0.86$ (95% CI

Table 5.1

Comparison of Women's Mistrust in Females and Androphilic Males

	Female			Androphilic Male			Mann-Whitney U		Effect Size $r = z/(n)^{1/2}$	Cohen's d (95% CI)
	n	M	SD	n	M	SD	Test Statistic (z)	p		
Canada	142	3.56	1.37	139	2.68	1.26	5.46	< .001	.33	0.67 (0.38, 0.95)
Samoa	103	5.75	1.57	103	4.71	1.69	5.09	< .001	.35	0.63 (0.36, 0.91)
Istmo Zapotec										
Woman vs <i>muxe gunaa</i>	53	5.92	0.77	51	5.63	1.07	1.30	.195	.13	0.32 (-0.07, 0.70)
Woman vs <i>muxe nguiiu</i>	53	5.92	0.77	53	5.00	1.30	3.76	< .001	.36	0.86 (0.46, 1.25)
<i>Muxe gunaa</i> ^a vs. <i>nguiiu</i>	51	5.63	1.07	53	5.00	1.30	2.34	.017	.23	0.53 (0.13, 0.91)

Note: Mean mistrust scores are reported, and could range from 1 (high trust) to 7 (high mistrust). Reported p -values are 2-tailed.

Due to the skewed nature of the data, Cohen's d effect sizes should be interpreted with caution. Effect size interpretations are as follows: $r = .1$ small, $.3$ medium, $.5$ large; $d = .2$ small, $.5$ medium, and $.8$ large (Cohen, 1988; Fritz et al., 2012).

^a For this comparison, women's mistrust in the *muxe gunaa* condition are reported in the "female" column.

[0.46, 1.25]). Ratings of trust in *muxe gunaa* showed a suggestive difference ($p = 0.017$) from ratings of *muxe nguiiu*, such that women reported greater mistrust of the more feminine *muxe gunaa*, Cohen's $r = .23$, Cohen's $d = 0.52$ (95% CI [0.13, 0.91]).

Discussion

The present study sought to replicate the finding that Western women place greater trust in gay men than they do in rival women (Russell et al., 2013; 2017), as well as examine the trust that women place in androphilic males in two cultures outside of Euro-America. In Samoa and among the Istmo Zapotec of southern Mexico, feminine androphilic males identify as belonging to the non-binary gender categories of *fa'afafine* and *muxe gunaa* respectively. In both Samoa and the Istmo Zapotec, gender non-binary males regularly engage in sexual behaviour with masculine, gynephilic men (Mirandé, 2016; Petterson et al., 2016, 2020), a factor that was predicted to impact the trust that women place in androphilic males. Using a mate-retention paradigm, women were randomly assigned to consider a scenario wherein their boyfriend/husband interacted alone with either a young single woman or a young single androphilic male, we tested the relative trust that women place in each category of individual.

Results from Canada replicated past work (Russell et al., 2013; 2017), showing that women were relatively more trusting of the gay man, than they were of a woman. These results further illustrate that Euro-American women do not perceive gay men as being genuine mate-poaching threats, whereas women are perceived as more likely to engage in mate-poaching behaviours (see also Chapter 2). We concur with Russell and colleagues (2013; 2017; 2018) that the most likely explanation for this finding is that Euro-American women rightly view mate-competition with gay men as unlikely, given that gay men rarely engage in sexual behaviour with

gynephilic men, and gynephilic men are overwhelmingly disinterested in the advances of androphilic males.

Contrary to our prediction that Samoan women would report equal mistrust in women and *fa'afafine*, women reported significantly greater mistrust toward a rival woman. This difference was nearly identical in magnitude to that found in Canada. This result was unexpected given that more than 40% of Samoan women report having competed with a *fa'afafine* for the romantic/sexual attention of a man (Chapter 2). Although inter-sexual mate competition between Samoan women and *fa'afafine* is common, Samoan women are more concerned about the prospect of their partner committing infidelity with a woman than with a *fa'afafine* (Chapter 4). Such heightened worry about partner infidelity with a woman would subsequently drive women to experience greater mistrust in a female rival than a *fa'afafine*. Why would Samoan women be concerned about female rivals, but relatively less concerned about *fa'afafine* rivals, when both are known to compete for, and sometimes successfully poach (Chapter 2), women's boyfriends/husbands? The Reproductive Threat Based Model of reaction to infidelity (Sagarin, Becker, et al., 2012) posits that women are most concerned about infidelity with a reproductive partner, so long as infidelity with a same-sex (i.e., non-reproductive) partner does not impugn the assumed gynephilia of her boyfriend/husband (Denes et al., 2015). It is fairly common for Samoan men to engage in fleeting sexual activity with *fa'afafine* (Pettersen et al., 2015, 2016, 2020), but to then return to their girlfriends/wives. As such, this type of infidelity is viewed as little more than a peccadillo in a Samoan cultural context. Bisexual behaviour appears to be widely recognized as commonplace among Samoan men, but it is not experienced as threatening by most women who recognize that this pattern of behaviour is coupled with a *preference* for female sexual partners. Consequently, infidelity with women is perceived as much more serious,

running the risk of offspring production with a rival, the channeling of resources toward that rival and her children, and total abandonment.

Data from the Istmo Zapotec were consistent with our predictions. Namely, women showed equivalent mistrust in other women and the highly feminine *muxe gunaa*. However, much like Western data, women showed more trust in the relatively masculine *muxe nguiiu*. Both findings illustrate the way in which women's trust in androphilic males can be moderated by cultural context and the expression of male androphilia. When androphilic males adopt feminine identities and compete directly with women for romantic/sexual access to men (Chapter 2) then women can display equivalent mistrust in rival women and rival third-gender males. Conversely, when male androphilia is expressed in a relatively more masculine form, such as the *muxe nguiiu* or gay men, women are less worried that such individuals represent viable mate-poaching threats. Although Istmo Zapotec women are equally distressed at the thought of their partner engaging in infidelity with either type of *muxe* (Chapter 4), and often show little concern when *muxe* attempt to poach their partners because they believe that their partners are disinterested in same-sex contact (Chapters 2 and 3), the present findings are explicable as a reflection of women's accurate perception of *muxes'* behaviour. Namely, *muxe* frequently and openly flirt with Istmo Zapotec men, with 85% of Istmo Zapotec women reporting that they have experienced some form of inter-sexual mate competition against a *muxe* (Chapter 2). Such competition is especially obvious when *muxe gunaa* flout their femininity in sexually provocative ways to garner attention from men. Not only are *muxe gunaa* more likely to engage in overt and proceptive displays of femininity than more masculine *muxe nguiiu*, Istmo Zapotec gynephilic men are more prone to be receptive to the advances of the former for precisely this reason. Because Istmo Zapotec women more easily recall instances of feminine *muxe gunaa*

flirting with men, and men in this culture are known to engage in sexual interactions with *muxe*, women are liable to find feminine *muxe* equally untrustworthy as rival women. Furthermore, in light of the observed findings, it is noteworthy that Istmo Zapotec women appeared more concerned that infidelity with a *muxe* calls into question their boyfriends/husbands sexual orientation (Chapter 4). In contrast to Samoa, Istmo Zapotec women see such infidelity as evidence that their boyfriends/husbands might be secretly androphilic, in turn raising the specter that they will be unable to retain their mates.

Limitations

The most obvious limitation in the present study is the considerable difference in age between the Canadian sample and those from Samoa and the Istmo Zapotec. This age difference may account for differences in overall levels of reported mistrust. Examination of Table 5.1 indicates substantial heterogeneity in reported mistrust, with Canadian women's overall mistrust tending to be below the midpoint of the scale with a positive skew, whereas overall mistrust reported by Samoan and Zapotec women is above the midpoint with a negative skew. The hypothetical task completed by all participants involved a 25-year-old individual interacting with their boyfriend/husband, meaning that Canadian women imagined their mistrust in an individual somewhat older than themselves, whereas Samoan and Istmo Zapotec women imagined their boyfriend/husband interacting with a considerably younger individual. Women may be sensitive to men's well-established preference for youth (Buss & Schmitt, 2019; Walter et al., 2020), creating floor effects among young Canadian women less concerned about an older rival, but ceiling effects among Samoan and Istmo Zapotec women imagining their partner interacting with a younger rival. Alternatively, differences in overall mistrust could be driven by cultural factors that were not presently measured. Understanding this variation, however, is beyond the scope of

the present study, and could only be accomplished with study designs measuring additional variables such as perceived mate competition levels in the local environment, the operational sex-ratio, and general social trust in strangers.

Conclusion

In experiments conducted in three disparate cultures, we replicated the finding that Euro-American women show greater trust in gay men than they do in other women, perceiving the latter as more likely to engage in mate-poaching behaviours. Similarly, women in Samoa were more mistrustful of other women than they were of *fa'afafine*, even though both women and *fa'afafine* are feminine, androphilic, and represent viable mate-poaching threats (Chapters 2 and 3). Last, women in the Istmo Zapotec reported comparable mistrust in both other women and feminine *muxe gunaa*, whereas they placed relatively greater trust in masculine *muxe nguiiu*. Collectively, the results of these studies show that women's trust in androphilic males, much like their direct mate-competition with them (Chapter 2), is culturally malleable.

Chapter 6: Women's Trust in Gay Men: An Experimental Study

Abstract

Many heterosexual women perceive gay men to be especially trustworthy friends because both groups are sexually attracted to men, but their romantic/sexual partners tend to be different types of men (i.e., heterosexual vs. gay). This reduces the possibility of sabotage in romantic/sexual competition and ulterior motives in friendship. We sought to replicate women's elevated trust in gay men in samples of single (Study 1) and partnered women (Study 2). Both studies used experimental primes to induce women to think of gay men as potential romantic/sexual competitors, thus lowering trust. Counter to our predictions, women in Study 1 showed equivalent trust when imagining receiving mating-relevant advice from a gay man and a heterosexual woman. In Study 2, partnered women reported greater mistrust when imagining a heterosexual woman interacting alone with their partner compared to a gay man doing the same. Experimental primes did not moderate trust in either study. These results partially replicate and extend past research, showing that partnered women display greater trust in gay men than other women in mating-relevant contexts. This is likely because Euro-American women do not perceive gay men to be romantic/sexual competitors, and psychological primes indicating the contrary do not undermine these perceptions.

Keywords: friendship, male sexual orientation, social priming, replication, inter-sexual mate competition

Introduction

Two of the most important relationships that humans seek in their lifetimes are for the purposes of friendship (Lewis, Al-Shawaf, Russell, & Buss, 2015; Seyfarth & Cheney, 2012) and mating (Buss & Schmitt, 2019). Occasionally, these domains intersect, with many people relying on their friends to help them initially attract, and later maintain, romantic/sexual relationships (Ackerman & Kenrick, 2009; Pham et al., 2015; Pham et al., 2014). Such *coalitional* mating strategies (also known as cooperative courtship) have potential downsides, including direct romantic/sexual competition with a same-sex friend (Ackerman & Kenrick, 2009; Buss, 1988a; Fisher & Cox, 2011; Lewis et al., 2015), or misperception of sexual intent or interest in mixed-sex friendships (Haselton & Galperin, 2013), which is particularly common among men (DeSouza, Pierce, & Hutz, 1992; Haselton & Galperin, 2013; Perilloux & Kurzban, 2015). However, one type of mixed-sex friendship ostensibly lacks *both* concerns—companionship between heterosexual women and gay men. The present research focused on the trust that Western heterosexual women place in gay men. We first attempted to replicate the finding that women place greater trust in mating advice received from gay men than from other women (e.g., Russell et al., 2013; Russell et al., 2017). Next, we sought to establish whether this trust extended to a mate retention paradigm, where women imagined their male partners interacting with either another woman, or a gay man. Last, in light of recent evidence that women compete with other women *and* same-sex attracted males for the same sexual partners, the frequency of which is moderated by culture (Chapter 2), we sought to experimentally prime women to think of gay men as potential romantic/sexual competitors, thus lowering the trust placed in them.

It is intuitive to understand why heterosexual women might value the friendship, and mating advice, of gay men. Both gay men and heterosexual women are sexually interested in

men (i.e., they are *androphilic*). Not only can a gay man offer insights about other men, it is unlikely that a gay man will jeopardize his friendship with a woman by harboring secret sexual attraction to her, and the friendship is likely to remain strictly platonic. Furthermore, although gay men are certainly *attracted* to masculine heterosexual men, these men tend to be exclusively sexually attracted to women (i.e., they are *gynephilic*) (J. M. Bailey et al., 2016; Rahman et al., 2019). Thus, despite the existence of a small number of men in Western contexts who have bisexual attractions (J. M. Bailey et al., 2016; Jabbour et al., 2020), the pool of potential mates available to heterosexual women is largely cordoned off from that of gay men, who generally seek out other gay men as sexual partners. Given these realities, friendships between heterosexual women and gay men are largely absent of potential romantic/sexual entanglements or direct competition for the same sexual partners.

Qualitative research has found that many women perceive gay men as especially trustworthy and honest friends (e.g., Castro-Convers, Gray Evans, Ladany, & Metzler, 2005; de la Cruz & Dolby, 2008; Grigoriou, 2004). Although this research has predominantly occurred in Euro-American contexts, heterosexual women deliberately befriending gay men is not a purely Western phenomenon. For example, a growing number of women in China are seeking friendships with gay men, whom they call *gaymi*, meaning “gay confidante” (X. Wang, Tan, & Wei, 2018). *Gaymi* are prized friends precisely because they are perceived as being trustworthy companions, without the potential pitfalls of friendships with either heterosexual men or other heterosexual women. In some cultures, including France, Holland, Germany, and Japan, there are specific terms for women who preferentially befriend gay men (reviewed in Bartlett et al., 2009). Quantitative cross-sectional studies have found that women’s friendships with gay men are positively associated with their body esteem (Bartlett et al., 2009), and independently rated

physical attractiveness (Russell, Babcock, et al., 2018). Even outside of a friendship context, women are more trusting of sales associates who are gay men (Rosenbaum et al., 2017) and show demonstrably more open and relaxed body posture when a new male acquaintance indicates same-sex attraction (Russell, Ickes, et al., 2018). Experimental research has found that women perceive advice received from gay men to be more trustworthy (Russell et al., 2013), especially when this advice is related to romantic/sexual contexts (Russell et al., 2017). This pattern of trust has been replicated in a small (unpublished) experiment in Croatia (Ivanović, 2018). Collectively, these studies indicate that many women preferentially seek out friendship with gay men due to the trust they can place in them, a trust predicated on the (accurate) perception that gay men are unlikely to subtly interfere in romantic/sexual pursuits, or harbor sexual interest towards their female companions (Russell, Babcock, et al., 2018; Russell, Ickes, et al., 2018).

Males who are exclusively androphilic are, by definition, disinterested in sexual contact with women, a pattern that likely holds in all cultures and borne out by self-report and viewing time measured conducted in non-Western cultures such as Samoa (Petterson et al., 2018). In world regions with adequate data, the rate of exclusive male androphilia is between \approx 2-6%, and does not considerably vary across cultures (J. M. Bailey et al., 2016; Gómez et al., 2018; Leser, 1961; Rahman et al., 2019; Semenyna, VanderLaan, Petterson, et al., 2017). There is substantially more cultural variability in gynephilic males' willingness to engage in sexual activity with other males, especially if those males present in a feminine (i.e., gender non-binary) manner (Petterson et al., 2020; Whitam, 1992). Culturally and historically differentiated expressions of male androphilia add to this complexity. In modern Euro-American cultures, most androphilic males identify as "gay" men. Elsewhere in the world, many androphilic males

present in a relatively feminine manner, and adopt gender identities outside of the man/woman binary (Murray, 2000; Nanda, 2014; Whitam, 1997). The two groups of androphilic gender-non-binary males that have been the focus of the most quantitative research are the Samoan *fa'afafine* (Vasey & VanderLaan, 2016) and the Istmo Zapotec *muxe* (Gómez et al., 2017; Gómez Jiménez, Court, et al., 2020) in southern Mexico. Both *fa'afafine* and *muxes* occur at a rate of \approx 2-6% of the male population (Gómez et al., 2018; Semenyna, VanderLaan, Petterson, et al., 2017). An important consideration for understanding the evolution of mating and friendship dynamics, is the fact that cultures where male androphilia is expressed in a the feminine, gender-non-binary form, have a higher number of sociocultural conditions thought to be typical of the human ancestral environment (VanderLaan et al., 2013). As such, the expression of male androphilia that is most common in Euro-American (i.e., gay men), is less typical in numerous other world cultures, and is likely to be somewhat historically recent (see also Murray, 2000; Norton, 1997).

Given these considerations, women's trust in androphilic males may not be immutable across culture and history. Although it is rare for Euro-American women to compete against gay men for the same romantic/sexual partners, the same is not true of all cultures. For example, in both Samoa, and the Istmo Zapotec, it is relatively commonplace for women to report competing against either *fa'afafine* or *muxes* for the same men (Chapter 2). There is little reason to think that Western women's trust in gay men is misplaced, although it should be recognized that this trust is due in large part to cultural dynamics influencing the expression of male androphilia, heterosexual men's (un)willingness to engage in sexual behaviour with feminine androphilic males, and the subsequent lack of direct mate competition that occurs between women and gay men in the West. In this way, women's trust in gay men emerges due to salient sociocultural features that create conditions conducive to trust. Indeed, women's trust in androphilic males vis-

à-vis other women shows some cultural variability. In a study conducted in Canada, Samoa, and the Istmo Zapotec, partnered women were randomly assigned to consider their trust in either an androphilic male or female interacting with their boyfriend/husband (Chapter 5), Both Canadian⁴ and Samoan women showed elevated trust in androphilic males, whereas women in the Istmo Zapotec only showed this pattern when the androphilic male in question presented in a more masculine fashion (i.e., *muxe nguiiu*, who are more similar to gay men). Istmo Zapotec women indicated equivalent (mis)trust in both women and feminine androphilic males, known as *muxe gunaa*.

The conditions which promote inter-sexual mate competition are not prevalent in Euro-American cultures and, as such, inter-sexual mate competition exists at negligible levels in such places (Chapter 2). We sought to understand whether Canadian women could be primed to think of gay men as potential rivals and if this in turn affected women's trust in them. We examined this in two contexts—mate acquisition, and mate retention. Priming effects on women's mating psychology is not without precedent. For example, Moss and Maner (2016) experimentally manipulated women's self-reported willingness to engage in casual sexual behaviour by priming them with varying ratios of men and women in the local mating pool. In a study even more germane to the present research, women primed with romantic/sexual themes evidenced more accurate detection of male sexual orientation (i.e., "gaydar") than women who did not receive such primes (Rule, Rosen, Slepian, & Ambady, 2011).

Consistent with Russell et al. (2013; 2017) our first prediction was that women imagining a mate acquisition situation (Study 1) would report significantly higher trust in the advice and

⁴ The Canadian sample in Chapter 5 are the same women in the control group for study 2 in this Chapter. The present study presents both additional experimental groups, and novel analysis not reported previously.

intentions of an acquaintance who is a gay man, relative to trust placed in a heterosexual woman. We also sought to extend previous research by examining the trust that partnered women placed in either a gay man, or another heterosexual woman, interacting alone with her partner (Study 2). We predicted that women would rate gay men as being less likely to engage in mate-poaching type behaviours (i.e., they would show elevated *mistrust* in a potential rival woman). Beyond these main effects, we predicted that among women who rated their trust in gay men, this trust would be reduced when they were primed to think of gay men as potential romantic/sexual competitors. Simply put, in both acquisition (Study 1) and retention (Study 2) paradigms, we predict a main effect of acquaintance gender, and an interaction between acquaintance gender and experimental condition. We did not anticipate that experimental conditions would modify women's trust in other women in either study.

Methodology

Statistical Power and Critical Alpha

In order to have sufficient power ($\beta \geq 80\%$) to detect moderate main effects ($d \approx .50$) found in previous research (Russell et al., 2013; 2017), and an interaction effect in our experimental design, an a priori power analysis indicated that a total sample of at least 260 participants would be required for each study (Faul et al., 2007). However, data collection continued for three full semesters (Spring and Fall 2017, and Spring 2018), rather than stopping once targets were reached. Due to concerns over replicability of novel research (Ioannidis, 2005), critical alpha was adjusted such that statistical tests with p -values between .05 and .005 were treated as “suggestive,” whereas p -values that were below this threshold ($p < .005$) were treated as significant (Benjamin et al., 2018).

Overall Procedure

All study measures and procedures were approved by the office of research ethics at the authors' institution and were administered using the Qualtrics® survey platform. Participants were recruited from the Psychology Departments of two mid-Western Canadian Universities, and received partial course credit for their online participation. After indicating informed consent, participants completed biodemographic information (described below). Participant women who were not in a romantic/sexual relationship participated in the Mate Acquisition Trust (MAT) task (Study 1), whereas women who were in romantic/sexual relationships participated in the Mate Retention Trust (MRT) task (Study 2) (See Appendix 2 and 3). Both studies involved two layers of random assignment to study conditions, the first involving possible study primes (no prime, control prime, and experimental prime conditions; see Appendix 4), and the second involving manipulation of the type of the individual involved in either the MAT or MRT (i.e., a heterosexual woman or a gay man). Following completion of either the MAT or MRT, participants then completed a rating task of the sexual orientation of male faces (see Chapter 7) before being debriefed regarding the purpose of the study. Participants were then informed that the articles used as study primes were not based on real psychological research.

Overall Measures

Basic biodemographic information was collected from participants, including their biological sex (i.e., male, female, prefer not to say), age, relationship status, ethnicity, and a 7-point Kinsey-style sexual orientation measure (Kinsey et al., 1948). Sexual attraction ratings ranged from 0 (exclusive sexual attraction to men) to 6 (exclusive sexual attraction to women). Women who indicated that they were in a committed romantic/sexual relationship were asked

further questions about the sex of their partner (male, female, or prefer not to say), relationship length (1 = 1-3 months; 2 = 3-6 months; 3 = 6 months to a year; 4 = 1-2 years; 5 = 2-5 years; 6 = 5 years or more), as well as the nature of their relationship (casually dating, monogamous relationship, or consensually non-monogamous relationship).

Overall Sample and Exclusions

A total of 1847 participants initially accessed the online survey in exchange for partial course credit. Twelve Individuals did not consent, 157 indicated that their biological sex was something other than “female” and were directed to the end of the survey, and 150 were removed for completing less than 90% of study measures. An additional 48 women were removed for either not indicating their Kinsey score, or indicating that they were predominantly sexually attracted to females (i.e., Kinsey ≥ 4). 18 women were removed for indicating that they were in romantic/sexual relationships with a biological female, 23 women were removed because they did not indicate their relationship status, 6 women were removed for giving conflicting information about their relationship status, and 6 women were excluded because they were in consensually non-monogamous relationships. Following these exclusions, 36 individuals were removed from the data for failing general attention check questions (e.g., “Please select option 4 for this question”). Last, only women who passed the trust task attention check question (described below) were retained for analysis. This resulted in a final sample of $n = 531$ in Study 1, and $n = 559$ in Study 2 (total $N = 1090$).

Study 1: Mate Acquisition Trust

Study 1 Procedure and Measures

After completing biodemographic information, women who were not currently in romantic/sexual relationships were randomly assigned to no prime, control prime, or

experimental prime conditions. Women in the no-prime condition proceeded directly to the trust rating task. Women in the control prime condition read a short newspaper article about sleep habits (text taken from Russell et al., 2017). Women in the experimental prime condition read a (fictitious) news report detailing how heterosexual men in Canadian universities were increasingly willing to engage in sexual activity with other men. This experimental prime was intended to induce women to see men, in particular gay men, as potential romantic/sexual competitors. All primes were approximately the same length (~300 words) and were formatted to look as if they were taken from the Technology & Science section of the well-respected *Canadian Broadcasting Corporation* News website (see Appendix 4). Participants in the prime conditions were told that the purpose of the task was to test their memory on details of the article, and that they should pay close attention so they could answer relevant questions later in the study.

The *Mating Acquisition Trust* task (MAT) asked women to consider the following scenario: “Imagine that you have recently been invited to a party by your friend. It is the night of the party and your friend becomes ill. However, they suggest you attend the party with one of their neighbours, a [gay man] **OR** [heterosexual woman] who is 25 years of age and single. You do not know this person, but you decide to go to the party with them anyway.” Women were randomly assigned to conditions where the neighbour was either a gay man or a heterosexual woman. Following the presentation of this scenario, women were asked to rate 10 questions pertaining to the trustworthiness of this neighbour. Participants rated the likelihood that the neighbour would engage in various behaviours that would either be helpful or unhelpful in mating-relevant situations. Questions were closely modelled after Russel et al. (2013; 2017), and included questions such as “How likely would you be to trust your acquaintance to tell you that

you have something stuck in your teeth before talking to an attractive man at the party?” and the reverse-scored item, “You and your acquaintance see a good-looking man, you want to talk to him but need to go to the bathroom. How likely is it that your acquaintance will go and flirt with this man when you are in the bathroom?” Women rated each question on a 7-point Likert scale ranging from 1 = *Very unlikely* to 7 = *Very likely*, and questions were coded such that higher scores represented greater trust in the acquaintance (See Appendix 3). This scale showed adequate reliability ($\alpha = .66$). Following these ratings, women were asked to identify whether the acquaintance was most likely to be sexually attracted to men, sexually attracted to women, or sexually attracted to both. Women who did not indicate that the acquaintance was sexually attracted to men ($n = 137$) were excluded, leaving 531 women for analysis.

Study 1 Results

Most women in Study 1 indicated that they had European or Anglo-American ethnicities (72.9%), with the remainder indicating South Asian (5.9%), African (5.1%), Asian Pacific (4.9%), or other ethnicities. The majority of participant women (72.1) identified as exclusively androphilic (i.e., Kinsey 0), with 21.1% reporting a Kinsey score of 1, 4.9% as Kinsey 2, and 1.9% as Kinsey 3. Kinsey score did not correlate with trust ratings, $r = 0.017$, $p = .704$. A total of 118 women were in the no-prime condition and proceeded directly from biodemographic questions to the trust task. A further 157 women saw the control prime before proceeding, and 256 women were assigned to the experimental prime condition. The average age of participants was 19.84 years ($SD_{\text{age}} = 2.82$, range = 17-48) and a suggestive difference was found between groups ($F(2, 528) = 3.44$, $p = .033$). Follow-up Tukey comparisons showed that participants in the no-prime condition were slightly older ($p = .025$) than those in the experimental prime condition. Because age did not correlate with overall ratings of trust ($r = -0.063$, $p = .149$), age

was not controlled for in subsequent analysis. In order to increase statistical power, we sought to combine the no-prime and control-prime groups into a single group. A 2 X 2 ANOVA (control prime vs. no prime, and neighbour gender) was not significant ($F(3, 271) = 1.745, p = .158$), so the two groups that did not receive the experimental prime were combined into one control group ($n = 275$).

The main analysis of interest was a 2 X 2 between-subjects ANOVA comparing women's trust across groups (Table 6.1). The model was not significant ($F(3, 527) = 0.167, p = .919$), showing no effect of neighbour gender ($F(1, 527) = 0.352, p = .553$), prime condition ($F(1, 527) = 0.004, p = .952$), and no interaction effect ($F(1, 527) = 0.129, p = .719$)⁵.

Table 6.1

Mate Acquisition Task Descriptive Statistics

Prime	N	Neighbour	Mean^a	SD
Experimental Prime	119	Woman	4.35	0.78
	137	Gay Man	4.36	0.68
No or Control Prime	139	Woman	4.33	0.83
	136	Gay Man	4.39	0.77

^a Note that higher scores represent greater trust in the Mate Acquisition Trust (MAT) Questionnaire.

Study 2: Mate Retention/Poaching Trust

Study 2 Procedure and Measures

Women who indicated that they were currently in a romantic/sexual relationship participated in the Mate Retention Trust task (See Appendix 2). After completing biodemographic information, women were randomly assigned to either the no prime, control prime, or experimental prime condition. Women in the no-prime condition proceeded directly to

⁵ This same pattern of results emerged when conducting a 3X2 ANOVA without collapsing the no-prime and control-prime groups, with neither the primes, nor neighbour gender showing a main effect, and no significant interaction between these factors.

the MRT. Women in the control prime condition read the same short newspaper article about sleep habits used in Study 1. Women in the experimental prime condition read a (fictitious) news report about newly published research indicating that a growing number of Canadian men left their long-term female romantic/sexual partners for relationships with other men. This experimental prime was intended to induce women to see gay men as potential mate poaching threats. Participants in the prime conditions were told that the purpose of the task was to test their memory on details of the article, and that they should pay close attention so they could answer relevant questions later in the study.

The Mate Retention Trust task (MRT) asked women to consider the following scenario: “Imagine that you and your boyfriend/husband have recently been invited to a party. It is the night of the party and you become ill. However, a [heterosexual woman] **OR** [gay man] who is your neighbour offers to go to the party with your boyfriend/husband. This person is 25 years of age and single. Your boyfriend/husband decides to go to the party with your neighbour, while you stay home sick.” Women were randomly assigned to conditions where the neighbour was either a gay man or a heterosexual woman. Following the presentation of this scenario, women were asked to rate nine questions pertaining to the trustworthiness of this neighbour. Questions were designed to partially emulate Russell et al. (2013; 2017), and included questions such as “How likely is it that your neighbour would flirt with your boyfriend/husband at the party?” and “How likely is it that the neighbour would put *extra* effort into their appearance after finding out that you won’t be coming to the party with your boyfriend/husband?” Women rated each question on a 7-point Likert scale ranging from 1 = *Very unlikely* to 7 = *Very likely*. The wording of questions meant that higher scores represented greater *mistrust* in the neighbour (Appendix 2). This scale showed high reliability ($\alpha = .91$). Following these ratings, women were

asked to identify whether the acquaintance was most likely to be sexually attracted to men, sexually attracted to women, or sexually attracted to both. Women who did not indicate that the neighbour was only sexually attracted to men ($n = 164$) were excluded, leaving 559 women for analysis.

Study 2 Results

Most participants indicated that they had European or Anglo-American ethnicities (81.8%), with the remainder indicating South Asian (3.2%), Asian Pacific (3.2%), African (2.5%), or other ethnicities. The median (and modal) relationship length was 1-2 years, and relationship length did not correlate with overall trust ratings ($r = -0.036, p = .397$). The majority of participant women (63.9%) identified as exclusively androphilic (i.e., Kinsey 0), with 28.8% reporting a Kinsey score of 1, 4.7% as Kinsey 2, and 2.7% as Kinsey 3. Kinsey score had a modest, suggestive correlation with mistrust ratings, $r = 0.089, p = .036$, but was not controlled for in subsequent analysis because the distribution of Kinsey scores did not differ across experimental conditions, $\chi^2(6, N = 559) = 9.252, p = 0.16$. One hundred and twenty-seven women were assigned to the no-prime condition and proceeded directly from biodemographic questions to the trust task. A further 154 women saw the control prime before proceeding, and 278 women were assigned to the experimental prime condition. The average age of participants was 20.47 years old ($SD_{age} = 3.36$, range = 17-49). Age was modestly correlated with overall ratings of trust ($r = -0.12, p = .005$), but was not controlled for in subsequent analysis because age did not differ across prime groups ($F(2, 556) = 0.701, p = 0.496$). In order to increase statistical power, we sought to combine the no-prime and control-prime groups into a single group. A 2 X 2 ANOVA (control prime vs. no prime, and neighbour gender) was significant ($F(3, 277) = 10.52, p < .001$), but the interaction term was not ($F(1, 277) = 0.055, p = .815$).

Because the two no prime and control prime groups did not differ in their overall level of trust in the MRT, ($t(279) = 0.858, p = .392$), they were combined into one control group ($n = 281$)⁶.

The main analysis of interest was a 2 X 2 ANOVA that compared MRT scores across groups (Table 6.2). The overall model was significant ($F(3, 555) = 24.19, p < .001$), showing a main effect of neighbour gender ($F(1, 555) = 70.26, p < .001$), such that women showed greater mistrust in a heterosexual woman in the MRT than in a gay man (*partial* $\eta^2 = 0.11$; Cohen's $d = 0.72$). There was no main effect of prime condition ($F(1, 555) = 0.864, p = .353$), and the interaction between neighbour gender and prime condition was non-significant ($F(1, 555) = 0.446, p = .504$)⁷.

Table 6.2

Mate Retention Task Descriptive Statistics

Prime	<i>N</i>	Neighbour	Mean^a	SD
Experimental Prime	155	Woman	3.74	1.48
	123	Gay Man	2.71	1.22
No or Control Prime	142	Woman	3.56	1.37
	139	Gay Man	2.68	1.26

^a Note that higher mean scores represent greater *mistrust* in the Mate Retention Task (MRT) Questionnaire.

Discussion

In two experiments, we sought to replicate the finding that heterosexual women are more trusting of gay men than heterosexual women, particularly when it comes to mating-related advice (i.e., cooperative courtship). We also sought to extend this finding to mate-retention scenarios where women rated the likelihood that either a gay man or a heterosexual woman

⁶ As noted above, this control group ($n = 281$) was used in Chapter 5, which examined within-culture differences in trust in women and androphilic males.

⁷ This same pattern was observed when conducting a 3X2 ANOVA without collapsing the no-prime and control-prime groups, showing only a significant main effect of neighbour gender, but no main effect of prime and no interaction among factors.

might engage in mate-poaching type behaviours. Although we predicted that women would show elevated trust in gay men in both contexts, only data from the mate-retention design (Study 2) were consistent with this prediction. In addition, we sought to understand if inducing women to think of gay men as potential rivals in mate competition would moderate trust. Despite a large sample of both single and heterosexually paired women, and an experimental design employing relevant primes, women's (mis)trust in gay men remained unchanged across experimental conditions.

It is unclear why Study 1 failed to replicate previous research documenting women's elevated trust in gay men (Russell, Babcock, et al., 2018; Russell et al., 2013; Russell et al., 2017). The trust questionnaire employed in Study 1 was nearly identical to Russell et al. (2013), and the average trust rating of gay men seems to be comparable across studies ($M = 4.37$ presently, $M = 4.45$ previously). However, women's trust in other heterosexual women appears to be elevated in our data ($M = 4.35$ presently, $M = 3.84$ previously) (Russell et al., 2013). As such, our data may illustrate women's trust in gay men, but features of the design failed to provoke appropriate suspicion or competitiveness with the heterosexual woman. Participants in our study imagined attending a party with an acquaintance, whereas Russell et al. (2013) had participants view a fictitious FaceBook profile before completing trust ratings. It is possible that receiving this additional information made the scenario more plausible for those participants and highlighted the gender and sexual orientation of the individual being evaluated. Additionally, the age of the acquaintance (25) was specified in our study, making this hypothetical person older than the average participant (20). Given men's well-established preference for youth (Buss & Schmitt, 2019; Walter et al., 2020), women in Study 1 may not have perceived a 25 year old heterosexual woman as a particularly salient rival in romantic/sexual competition.

The data from Study 2 were consistent with our predicted main effect. Namely, partnered women imagined that a gay man was significantly less likely to engage in mate-poaching type behaviours than a heterosexual woman, regardless of experimental prime to which they were exposed. Not only does this finding extend women's trust in gay men to mate-retention scenarios, it also converges with other evidence that Euro-American women do not perceive gay men as being mate competition threats (Chapter 2).

The experimental design employed in Study 1 and Study 2 found no evidence that women's trust in gay men could be modified by primes portraying gay men as romantic/sexual competitors. Social priming is a contentious research area, with many inconsistent effects and numerous failed replications (T. Chivers, 2019). Although multiple meta-analyses have found connections between priming and behavioural or affective outcomes (Cameron, Brown-Iannuzzi, & Payne, 2012; Lodder, Ong, Grasman, & Wicherts, 2019; Weingarten et al., 2016) these effects tend to be modest, with some evidence of publication bias (Lodder et al., 2019). Additionally, most past priming research has focused on the rapid, sometimes subconscious, presentation of single words or images in order to activate target concepts (Cameron et al., 2012). It is possible that the complex prime employed in the present study was simply incapable of activating a concept of mate competition *between* the sexes that is largely absent from Euro-American mating markets, and dismissed as trivial when it does occur (Chapter 2). Instead, the primes we employed may have introduced a novel concept that was insufficient to provoke a measurable change in trust. If Euro-American women can be primed to think of gay men as potential competitors, rather than trustworthy friends, these effects may be small and difficult to ascertain.

Limitations

Although substantial effort was devoted to excluding inattentive participants, it is possible that our results were confounded by participants not paying adequate attention to the experimental primes, the trust rating task, or both. Future studies could enhance attention by employing in-lab tasks, which have been shown to strengthen priming effects relative to online administration (Lodder et al., 2019). Additionally, the party scenario, or the experimental primes, may have lacked mundane realism, making them implausible. This limitation is compounded by the fact that participants did not rate the degree to which they believed the claims of the newspaper articles used as primes. This could have created doubt in the minds of the women that the primes were real which, in turn, would have affected our results. Although these factors are certainly relevant, we prefer a simpler interpretation of our results. Unlike Samoan and Istmo Zapotec women (Chapter 2), Canadian women do not perceive gay men as romantic/sexual competitors and reading a short article that implies the possibility of inter-sexual mate competition cannot alter this. As discussed in the introduction, the requisite features leading to high levels of inter-sexual mate competition are culturally and contextually complex, and even then do not inevitably produce reduced trust in androphilic males (Chapter 5). Whatever effects of psychological priming might exist in this domain, they would likely be subtle and perhaps incapable of overwhelming a lifetime of experience indicating that the potential pools of mates available to gay men and heterosexual women do not overlap.

Conclusion

The present research extends our understanding of Euro-American women's trust in gay men, with partnered women perceiving gay men as less likely to engage in mate-poaching type behaviours. Furthermore, our null-results regarding the ineffectiveness of the primes illustrates

that a modest psychological prime is inadequate to over-ride a general pattern that is true in Euro-America—although gay men and heterosexual women are both attracted to men and masculinity, they nonetheless inhabit separate mating enclaves. This makes them natural allies in their mutual—and occasionally coalitional—pursuit and maintenance of relationships.

Chapter 7: Judging Male Sexual Orientation: Women's Accuracy is Not Affected by Psychological Priming or Menstrual Cycle

Abstract

Previous research has demonstrated that women can correctly differentiate the faces of men who are gay or heterosexual at levels significantly above chance. This ability appears to be heightened when women are primed with romantic thoughts, as well as during the most fertile portion of their menstrual cycle. In a large sample ($n = 1734$) of undergraduate women, we sought to replicate each of these effects. Because heterosexual women and gay men are both androphilic (i.e., attracted to men and masculinity), we primed women in an experimental group to view gay men as potential romantic competitors. Women's correct identification of sexual orientation (62%) was significantly higher than chance, but was unaffected by random assignment to psychological prime or control conditions. In a subsample of naturally-cycling women ($n = 379$), we failed to replicate past research indicating that women's ability to judge sexual orientation from faces is highest when they are in the fertile phase of their menstrual cycle. Our results further replicate the legibility of male sexual orientation, but cast doubt on this ability being tied to recognizing potential opposite-sex romantic rivals, or fertility status.

Keywords: judgement accuracy; male sexual orientation; gaydar; experimental priming; inter-sexual mate competition

Introduction

Although sexual orientation is an intimate, personal trait, there is substantial evidence that this characteristic is not entirely hidden (Rule, 2017). If a naïve observer were to guess whether a man was exclusively sexually attracted to women (i.e., *gynephilic*), and a woman was exclusively attracted to men (i.e., *androphilic*), they would be correct in 90-95% and 85-90% of instances, respectively, based on population prevalence rates of heterosexual attraction (J. M. Bailey et al., 2016; Geary et al., 2018; Rahman et al., 2019). However, numerous studies indicate that the sexual orientations of gay men and lesbian women can be identified at levels significantly above chance (reviewed in Rule, 2017). Women's ability to detect male sexual orientation—colloquially known as “gaydar”—appears to be heightened when they are primed with mating-relevant cues, as well as during the fertile phase of their menstrual cycle (Rule, Rosen, et al., 2011). This suggests that women's ability to detect male sexual orientation is at least partially rooted in identifying appropriate romantic partners (i.e., heterosexual men), and hence mate-choice mechanisms related to sexual selection (Buss & Schmitt, 2019; Darwin, 1871). The present study attempted to replicate women's ability to accurately perceive male sexual orientation, and the capacity for mating-relevant psychological primes to elevate this skill. Unlike previous research, which showed that women primed with romantic thoughts displayed increased accuracy (Rule, Rosen, et al., 2011), we primed women to think of gay men as potential romantic/sexual *competitors* to see if this manipulation also produced heightened accuracy. In addition to these aims, we also tested whether male sexual orientation is more legible to women who are in the fertile phase of their menstrual cycle.

Gay men frequently display cues of gender atypicality in voice, gesture, and self-presentation (J. M. Bailey et al., 2016; Rule, 2017), which can lead unfamiliar observers to

accurately identify them as androphilic (Rieger, Linsenmeier, Gygax, Garcia, & Bailey, 2010; Valentova, Rieger, Havlíček, Linsenmeier, & Bailey, 2011). Even in lab settings where gay men were instructed to conceal their sexual orientation (and associated gender atypicality) while describing the weather or doing a mock job interview, observers were nonetheless accurate in perceiving them as same-sex attracted after viewing short video clips (Sylva, Rieger, Linsenmeier, & Bailey, 2010). When evaluating male sexual orientation, most people rely on complex, detail-rich information, including adornment of the face and body, voice pitch, gestures and body movement, and overall appearance (Rule, 2017). However, one specific cue to male sexual orientation that is under less conscious control than these factors, has received considerable empirical attention—the face.

The first studies to systematically examine the legibility of sexual orientation from faces found that participants correctly identified faces belonging to gay and straight men at levels above chance accuracy (Rule, Ambady, Adams, & Macrae, 2008)⁸. This accuracy was maintained even when occluding individual portions of the face (hair, eyes, mouth), or when only presenting these features in isolation. These initial findings have now been replicated across numerous studies by independent research groups (e.g., Brewer & Lyons, 2017; Cox, Devine, Bischmann, & Hyde, 2016; Freeman, Johnson, Ambady, & Rule, 2010; Hughes & Bremme, 2011; Lyons, Lynch, Brewer, & Bruno, 2014; Rule, Rosen, et al., 2011; Tabak & Zayas, 2012). Typically, these studies present a series of facial photographs taken from online dating profiles or social media, half of which belong to men who identify as gay, and the other half to men who are straight. Participants correctly identify male sexual orientation at an accuracy rate of roughly

⁸ These studies typically examine human ability to detect female sexual orientation as well, but such skills are not the focus of the present study.

60-65%, and this same pattern is evident when pictures are instead taken under standardized lab conditions (Rule, Johnson, & Freeman, 2017). Accuracy rates are even higher (80-90%) when neural network algorithms are trained to classify a series of faces taken from online dating profiles, as belonging to either gay or straight individuals (Y. Wang & Kosinski, 2018). Although these testing conditions artificially present a 50:50 ratio of gay and heterosexual men, which would lead to substantially lower classification accuracy in real-world settings where the true proportion of gay men is between 2-5% of the population (Gelman, Mattson, & Simpson, 2018; Plöderl, 2014), detection of male sexual orientation from facial stimuli in these studies is nonetheless a replicable phenomenon (Rule, 2017).

The chief proximate explanation of these findings is that gay men display some degree of sex-atypical facial morphology, which subsequently informs participant decisions⁹. This assertion is supported by studies showing that participants rate the faces of gay men as more feminine than those of heterosexual men (Freeman et al., 2010; Lyons et al., 2014; Robertson, Kingsley, & Ford, 2019; but see Varella Valentova, Kleisner, Havlíček, & Neustupa, 2014). These subjective evaluations are complemented by more objective faciometric studies. Although heterogeneous in their design, and precise quantification of facial metrics, these studies have generally found that gay men do display some objective facial feminization (Robertson et al., 2019; Skorska, Geniole, Vrysen, McCormick, & Bogaert, 2015; Varella Valentova et al., 2014). Further replication is necessary, but current evidence points towards the eyes, mouth, nose, and cheek-bone prominence of gay men being somewhat sex-atypical relative to heterosexual men. These same regions show somewhat reliable sex differences (Burke & Sulikowski, 2010) and

⁹ Some researchers have found that gay men upload higher-quality online images than heterosexual men, and this underlies the accuracy effect (Cox et al., 2016). This difference does not appear to apply to stimuli used in most studies (Rule et al., 2017).

likely inform sexual orientation classification decisions (see also Skorska et al., 2015; Y. Wang & Kosinski, 2018).

The ultimate evolutionary reason (*sensu* Tinbergen, 1963) that humans learn to detect sexual orientation may be linked to selecting appropriate romantic/sexual partners. This means that women's ability to detect male sexual orientation may help them avoid investing in potential mates who harbor no attraction to women (i.e., gay men), especially when women are most fertile (Rule, Rosen, et al., 2011). This explanation is both sensible, and supported by existing data (Rule, 2017), but another less intuitive possibility exists. Women may be sensitive to cues of male sexual orientation for the same reason they can accurately identify female sexual orientation—mate competition. Specifically, because both heterosexual women and gay men are attracted to men (i.e., they are androphilic), it is possible that they could directly compete over the same targets, engaging in *inter-sexual* mate competition (Chapter 2; Vasey, Leca, et al., 2014). Indeed, compared to other sexual orientation groups, heterosexual women and gay men are most accurate at identifying *female* sexual orientation (Brewer & Lyons, 2017; Lyons et al., 2014), a pattern that makes sense if both groups are sensitive to detecting the most likely rivals for the attention of masculine men—androphilic women. Inter-sexual mate competition between women and gay men does not appear to be common in Euro-American settings, but it does nonetheless occur (Chapter 2). As such, women's accuracy in evaluating male sexual orientation could be the result of pressure to identify potential rivals in romantic/sexual competition, independent of the sex of such rivals. In order to test this possibility, we examined whether women were more accurate at detecting male sexual orientation when primed to think of gay men as potential romantic/sexual competitors.

Predictions

The present research had three primary goals and three main predictions. The first goal was to directly replicate women's ability to detect male sexual orientation. We predicted that women in our sample would identify male sexual orientation at levels above chance. Our second goal was to test whether cues of inter-sexual mate competition would lead women to greater accuracy when identifying male sexual orientation. We predicted that women who were randomly assigned to view psychological primes indicating that gay men were potential rivals in romantic/sexual competition would show increased accuracy in detecting male sexual orientation compared to women randomly assigned to control conditions. Last, we sought to test whether identification of male sexual orientation was related to women's ovulatory cycle. We predicted that accuracy would be at its zenith when naturally cycling women were in the most fertile phase of their ovulatory cycle.

Method

Procedures

All study measures and procedures were approved by the office of research ethics at the authors' institution, and were administered using the Qualtrics® survey platform. Participants were recruited from the Psychology Departments of two mid-Western Canadian universities and received partial course credit for their online participation. Data collection continued for the Spring and Fall semesters of both 2017 and 2018. After indicating informed consent, participants completed biodemographic information including their biological sex (i.e., male, female, prefer not to say), age, relationship status (single, in a committed relationship), ethnicity, and a 7-point Kinsey-style sexual orientation measure (Kinsey et al., 1948). Sexual attraction ratings ranged from 0 (exclusive sexual attraction to men) to 6 (exclusive sexual attraction to women). Women

who indicated that they were in a committed romantic relationship were asked further questions about the sex of their partner (male or female), and relationship length (1 = 1-3 months; 2 = 3-6 months; 3 = 6 months to a year; 4 = 1-2 years; 5 = 2-5 years; 6 = 5 years or more). Each participant also completed the Sociosexual Orientation Inventory Revised (SOI-R) (Penke & Asendorpf, 2008), which measures women's uncommitted sexual behaviour, along with their attitudes toward and desire for such sexual activity. The SOI-R showed high reliability in our sample ($\alpha = .86$).

After completing biodemographic information, women were randomly assigned to either no-prime, control prime, or experimental prime conditions. Women in the no prime condition proceeded directly to study tasks, whereas those in the control prime condition read a short newspaper article about sleep habits (text taken from Russell et al., 2017). The experimental prime condition consisted of two possible primes. Women who were single read a (fictitious) news report detailing how heterosexual men in Canadian universities were increasingly willing to engage in sexual activity with other men, whereas women in relationships read a news report indicating that a growing number of Canadian men left their long-term female romantic partners for relationships with other men. These experimental primes were intended to induce women to see men, in particular gay men, as potential romantic/sexual competitors. All primes were modelled on the Technology & Science section of the well-respected *Canadian Broadcasting Corporation* News website, ostensibly reporting on recently conducted scientific research (see Appendix 4).

Next, participants were informed that they would be viewing a series of faces and asked to indicate each man's probable sexual orientation as gay or straight. Participants were instructed not to think about any one face for too long, but instead to trust their intuition. Facial stimuli

were identical to those used in Rule, Rosen, et al. (2011), and included 40 faces of self-identified gay men, and 40 self-identified straight men. Images were grey-scaled, standardized for size, and did not include individuals with facial adornment (e.g., beard, jewelry, etc.). Each participant rated faces in a unique randomized order. Two radio buttons were presented beneath each face, with “Gay” always appearing on the left and “Straight” always appearing on the right in order to reduce participant confusion and fatigue. As soon as a response was recorded, the next face was displayed. Participants could not alter their responses, and no feedback was given to them regarding accuracy. Following this task, women completed the Modern Homonegativity Scale (MHNS) (Morrison & Morrison, 2003), and the 5-item socially desirable response set (SDRS) (Hays, Hayashi, & Stewart, 1989), both of which showed high reliability ($\alpha = .86$ and $.92$ respectively). Additionally, women provided detailed information about their menstrual cycle (Blake, Dixson, O'Dean, & Denson, 2016), including their use of hormonal birth control, regularity of their menstrual cycle, typical cycle length, and the date of last menstruation onset.

Sample and Exclusions

A total of 2608¹⁰ participants initially accessed the online survey. Several individuals were excluded for either not providing consent (19) or completing no questions after providing consent (84). An additional 194 individuals indicated that their biological sex was something other than “female” and were directed to the end of the survey, and 135 were removed for completing $\leq 95\%$ of study measures. Following these exclusions 18 individuals were removed for failing to rate ≥ 5 facial stimuli¹¹, and 14 individuals were removed for taking longer than 24

¹⁰ 1847 of these individuals were also included in the data set reported in Chapter 6. Data cleaning procedures differed slightly for the present sample, and included additional participants who did not complete the trust tasks reported on in Chapter 6.

¹¹ For participants with < 5 missing face ratings, missing values were replaced with the modal response for that face. Missing data comprised $< 0.15\%$ of all face ratings.

hours to complete all measures. An additional 21 individuals were removed for not indicating their sexual orientation, 50 for indicating predominant sexual attraction to females (i.e., Kinsey ≥ 4), and 8 for indicating being in a romantic relationship with a woman. Last, 49 individuals were excluded for failing obvious attention check questions dispersed in questionnaire measures (e.g., “Please select option 4 for this question”).

Because of the large number of participants, and the ease of online participation, some additional exclusions were employed in order to increase data quality and exclude participants who evidenced undue bias in rating faces. Such bias was defined as identifying an unusually high number of faces as gay (≥ 30) combined with an unusually low number of faces identified as straight (≤ 10), or vice versa. This response pattern represents being an outlier¹² in correct identification of one face type, while simultaneously being an outlier for incorrect identification of the other face type. A total of 269 women were removed for identifying too many faces as straight men, and 13 were removed for identifying too many faces as gay men, consistent with overall response bias found in previous research (Freeman et al., 2010; Rule et al., 2015). This decision rule excludes participants who may be showing substantially biased and/or careless responding, but retains those who are especially accurate or inaccurate without showing a pervasive bias in their ratings. A final sample of 1734 women was available for analysis.

Categorization Accuracy and Bias

Accuracy and bias in detecting male sexual orientation was evaluated using Signal Detection Theory (Stanislaw & Todorov, 1999). A “hit” was defined as correctly identifying the face of a straight man as straight. A “false alarm” was defined as identifying a face belonging to

¹² Assuming a probability of 0.50 of correct identification of straight faces, getting ≥ 30 or ≤ 10 straight faces correct corresponds to a z -score ≥ 3.29 using a binomial z -test. (The same is true of correct identification of gay faces.)

a gay man as straight. (The determination of these proportions also necessarily tells you both the rate of misses and of correct rejections.) These proportions were used to calculate accuracy (A') and bias (B''). A' is a nonparametric measure of sensitivity, which indicates percentage correct adjusted for bias. Values of 0.5 represent chance performance, and values of 1 represent perfect accuracy. B'' is a nonparametric indicator of response bias, with possible values of ± 1 , and a value of 0 indicating no response bias. Presently, negative B'' values indicate a bias toward labelling stimuli as straight men, whereas positive values indicate a bias in favour of labelling stimuli as gay men. For the sake of simplicity, overall accuracy in classifying the 80 faces is also reported.

Results

In order to control the type-II error rate, critical alpha was adjusted such that statistical tests with p -values between .05 and .005 were treated as “suggestive,” whereas p -values that were below this threshold ($p < .005$) were treated as significant (Benjamin et al., 2018). Across the full sample ($n = 1734$), the mean age of participants was 20.20 years ($SD_{\text{age}} = 3.15$, range = 17-59). Most participants indicated that they had European or Anglo-American ethnicities (77.7%), with the remainder indicating South Asian (4.3%), Asian Pacific (4.3%), African (4.3%), or other ethnicities. A majority of participants (51.8%) were currently in committed romantic relationships, for a median (and modal) length of 2-5 years. Most women (65.2%) reported being exclusively androphilic (i.e., Kinsey 0), with 26.3% reporting a Kinsey score of 1, 5.8% as Kinsey 2, and 2.7% as Kinsey 3. Three hundred and sixty-eight women were assigned to the no prime condition, 471 women to the control prime condition, with 428 single and 467 partnered women exposed to an experimental prime. In order to increase statistical power, we sought to collapse the no prime and control prime conditions, as well as the two experimental

prime conditions. Using independent samples *t*-tests, we tested for differences in accuracy, bias, and percentage of correct classifications. No significant differences were found between the no-prime and control-prime groups, or between the two experimental prime groups (all $t \geq 1.80$, all $p \geq 0.072$). As such, groups were collapsed into control ($n = 839$) and experimental-prime ($n = 895$) groups.

Accuracy and bias values are reported in Table 7.1. Among all participants, women classified sexual orientation above chance levels, as indicated by significant one-sample *t*-tests of both A' ($t_{(1733)} = 43.85, p < .001, d = 1.05$) and percentage correct ($t_{(1733)} = 41.73, p < .001, d = 0.96$) compared to no effect values (i.e., 0.50 or 50%). Participants showed a bias toward rating faces as belonging to heterosexual men, as indicated by mean B'' values being significantly below the no-bias value of zero ($t_{(1733)} = -29.30, p < .001, d = -0.70$).

Control and experimentally primed groups were compared using two-tailed independent samples *t*-test. No significant differences were found on measures of accuracy ($t_{(1732)} = 0.36, p = 0.722, d = 0.02$), bias ($t_{(1732)} = -0.95, p = 0.338, d = -.05$), or percentage correct ($t_{(1732)} = 0.33, p = 0.744, d = 0.02$).¹³

Table 7.1

<i>Accuracy and Response Bias Among All Participants and Experimental Groups</i>			
<i>Group</i>	<i>A' (SD)</i>	<i>Percentage Correct (SD)</i>	<i>B'' (SD)</i>
All women ($n = 1734$)	0.62 (.11)	56.8 (6.8)	-0.10 (.14)
Control ($n = 842$)	0.62 (.11)	56.9 (6.7)	-0.10 (.14)
Experimental ($n = 900$)	0.62 (.11)	56.8 (6.9)	-0.10 (.15)

Because our experimental primes did not affect any outcomes of interest, post-hoc exploratory regression analyses were conducted to understand if any measured variables were

¹³ This same pattern of null results was evident when comparing all four experimental groups on outcomes of interest using a one-way ANOVA (all $F < 1.55$, all $p > .200$).

related to accuracy, bias, and percentage correct. These regressions included simultaneous entry of all predictor variables, including age, relationship status, Kinsey score, mean sociosexual behaviour, attitudes, and desire score, mean Modern Homonegativity score, and mean socially desirable responding score. Although both of the latter measures were completed after exposure to experimental primes, the control and experimental groups did not differ in their mean MHNS scores, $t_{(1732)} = 0.68, p = .499$, or on their mean SDRS scores, $t_{(1732)} = -0.08, p = .934$. All regression models were either suggestive or significant overall (see Table 7.2), but the variance accounted for was modest. Age shared a small association with heightened accuracy and less response bias, whereas homonegativity was associated with reduced accuracy and more bias towards classifying faces as belonging to gay men.

Table 7.2

<i>Exploratory Multiple Regressions Predicting Accuracy and Response Bias</i>			
	<i>A'</i>	Percentage Correct	<i>B''</i>
Age	.129**	.125**	-.062*
Relationship Status	.005	.009	.016
Kinsey Score	.024	.030	.017
Sociosexual Behaviour	-.009	-.003	.001
Sociosexual Attitudes	-.051	-.047	.060
Sociosexual Desire	-.006	-.007	-.026
Homonegativity	-.056*	-.058*	.056*
Social Desirability	.011	.014	-.016
Model Significance	$F(8, 1725) = 5.15,$ $p < .001$	$F(8, 1725) = 5.10,$ $p < .001$	$F(8, 1725) = 2.04,$ $p = .038$
Adjusted R^2	1.9%	1.9%	0.5%

note: Relationship status coded as 0 = single, 1 = partnered. Standardized betas reported.

* $p < .05$; ** $p < .005$

The relationship between fertility and accuracy was examined among a subsample of naturally cycling women. These women fit stringent inclusion criteria (Blake et al., 2016) including not being pregnant/breastfeeding, not having given birth in the last 3 months, not currently being on hormonal birth control or having used it in the last 3 months, having no

diagnosed or potential fertility problems (e.g., polycystic ovarian syndrome, endometriosis, etc.), and having a consistent menstrual cycle between 25-35 days in length. Backwards-counting methods (Brinsmead-Stockham, Johnston, Miles, & Neil Macrae, 2008) were used to estimate menstrual cycle phase for each woman using their usual cycle length and the date of last menstruation onset. This allowed us to calculate the next predicted ovulation, peak fertility (next predicted ovulation minus 14 days), and number of days pre- or post-peak ovulation (difference between peak ovulation and date of survey completion). Consistent with Rule, Rosen, et al. (2011), a standardized ovulation ratio was calculated for each eligible participant. For women who were past their peak estimated fertility, the ovulation ratio was the number of days post-peak divided by 14. Women at their peak were simply scored a zero. For women before their peak, the number of days pre-peak was divided by the difference between peak ovulation and the remainder of their cycle length. Only participants with ovulation ratios between ± 1.25 were included, allowing us to retain women who were predicted to menstruate around the time of survey completion, but who had not yet done so. Among all participants, 379 women fit this inclusion criteria, with a mean age of 20.43 years ($SD = 3.85$, range 17-49), and a mean cycle length of 28.8 days ($SD = 2.08$). Polynomial regressions tested curvilinear relationships between ovulation ratio and both accuracy and bias. There was no significant curvilinear relationship between ovulation and A' ($F(2, 376) = 0.873, p = .419, R^2 = 0.005$) or B'' ($F(2, 376) = 0.852, p = .427, R^2 = 0.005$). These relationships are displayed in Figures 7.1 and 7.2 respectively.

The present sample substantially overlaps with data from Chapter 6, where it was reported that psychological primes had no impact on trust ratings in an imagined mating-relevant social scenario. Because it is possible that doing this trust scenario could impact the presently reported results, all analyses were repeated for those women who were not presented with the

trust task, and thus proceeded directly from either the control or experimental prime, to the face-rating task ($n = 536$). The pattern of results among this subsample was identical to that reported above. We have opted to report on the full sample considering the increased statistical power of the larger sample, and the ineffectiveness of the psychological primes to alter any target outcomes.

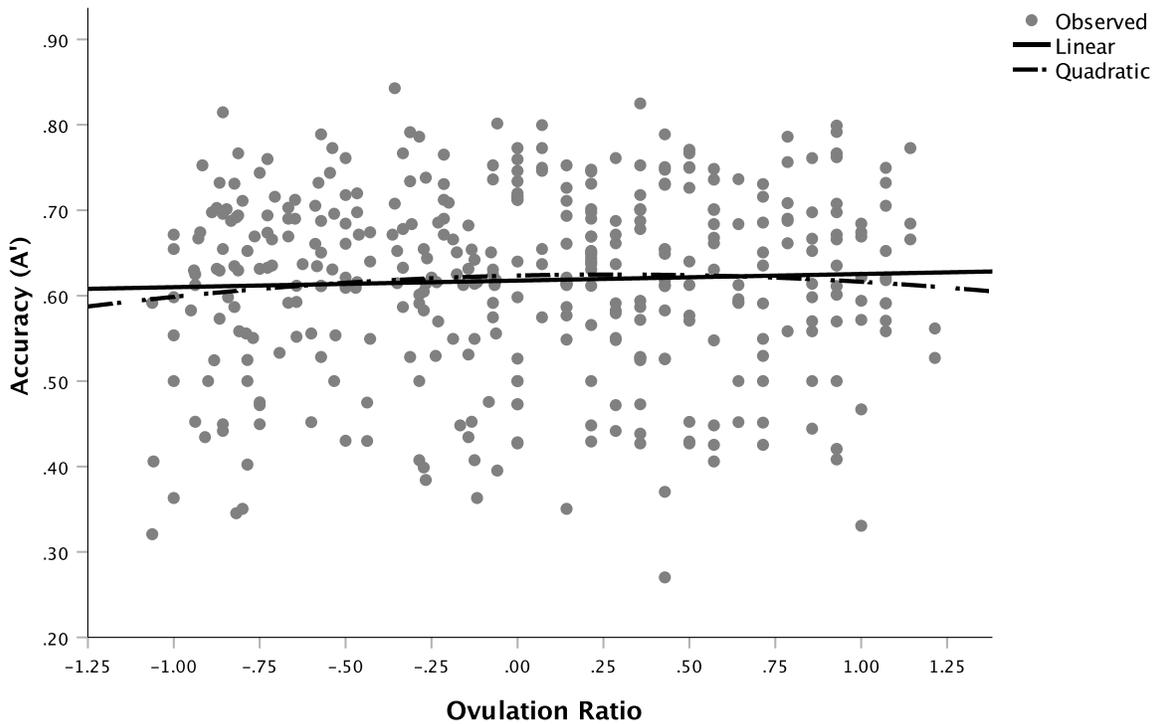


Figure 7.1: Women's Accuracy (A') in Categorizing Men's Sexual Orientation as a Function of Current Fertility Status (Ovulation Ratio)

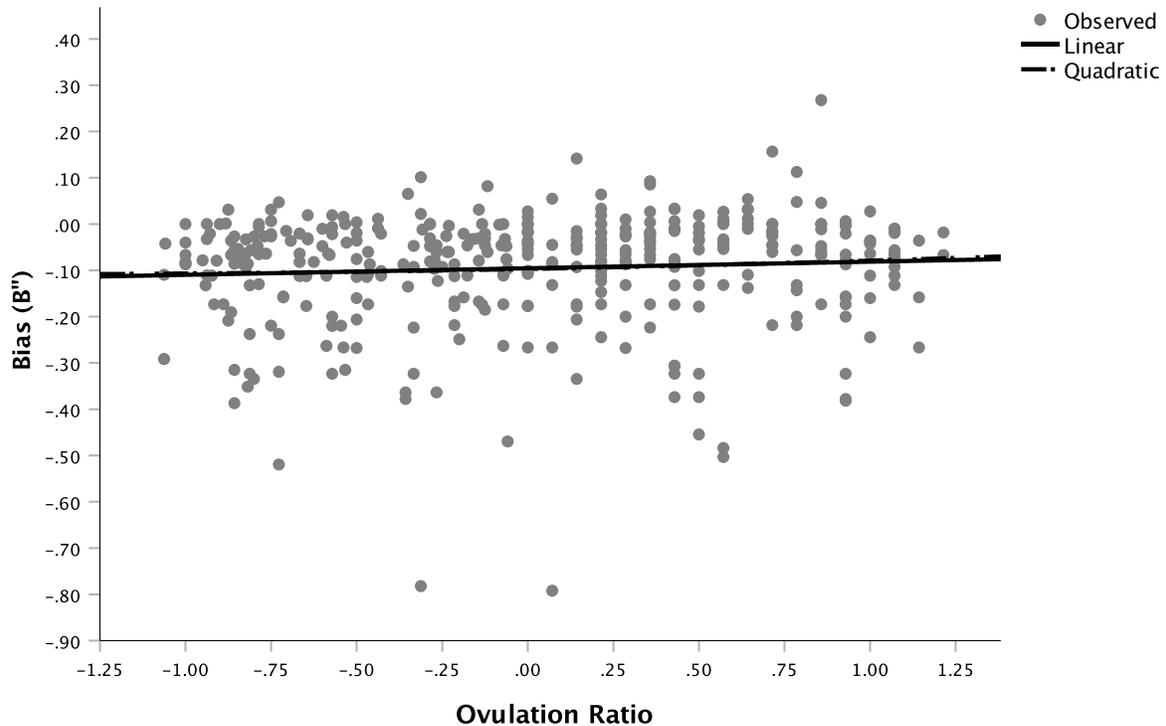


Figure 7.2: Women’s Bias (B'') in Categorizing Men’s Sexual Orientation as a Function of Current Fertility Status (Ovulation Ratio)

Discussion

In a large convenience sample of young undergraduate women, we replicated women’s well-documented ability to discern male sexual orientation from faces (Rule, 2017). To date, this represents the single largest sample of women who rated the sexual orientation of a standardized set of male faces, and women’s bias-corrected accuracy (~62%) is consistent with previous research (Rule, Rosen, et al., 2011). Counter to our predictions, women’s accuracy did not increase when they were primed to think of gay men as potential romantic/sexual rivals compared to women receiving no such psychological prime. Contrary to previous research showing that women’s judgement of male sexual orientation is most accurate during the fertile phase of their ovulatory cycle (Rule, Rosen, et al., 2011), we found no evidence that accuracy was related to fertility.

Although the present study further replicates the legibility of male sexual orientation, it does not inform the mechanism by which such decisions are made. Eye-tracking methodologies could indicate what regions of the face guide participant decisions. Because gay men show somewhat feminine facial structure (Robertson et al., 2019; Skorska et al., 2015; Varella Valentova et al., 2014), women may make decisions on this basis, especially if women have life-experience associating such femininity with male sexual orientation. The exploratory regression analyses are consistent with this interpretation, as age was positively associated with accuracy. This relationship may reflect more lifetime opportunities to interact with gay men, from which women make face-based inferences about sexual orientation. This ability need not be conscious, as previous research has shown that women's objective accuracy is unrelated to their perceived accuracy (Rule et al., 2008, Study 4), and accuracy is maintained even when stimuli are presented for only a fraction of a second (Rule & Ambady, 2008). Regression analysis also showed that having more negative attitudes towards gay men was related to less accurate ratings, due in part to a bias toward rating more faces as belonging to gay men. This replicates past work that has generally found similar patterns (Brewer & Lyons, 2017; Rule et al., 2015).

The present study attempted to experimentally induce women to view gay men as potential romantic/sexual competitors, which was predicted to heighten accuracy in the sexual orientation rating task. However, women's accuracy did not differ across control or experimental conditions. Many priming studies show inconsistent results, or replicate poorly (T. Chivers, 2019), and the primes presently employed also failed to impact women's trust ratings in gay men (Chapter 6). It is possible that the psychological primes did not *activate* an existing concept, as is typical in most priming research (Cameron et al., 2012; Lodder et al., 2019; Weingarten et al., 2016), but instead attempted to introduce the largely novel possibility that gay men actively

participate in romantic/sexual competition against women. The infrequency with which inter-sexual mate competition occurs in Western cultural contexts (Chapter 2) is consistent with this possibility. Previous research has found that women primed with romantic thoughts evidence increased accuracy in rating male sexual orientation (Rule, Rosen, et al., 2011). The present experiment does not contradict this finding, but instead suggests that, in a Western context, women's ability to detect male sexual orientation is tied to finding an appropriate mate, and not identifying potential inter-sexual rivals in romantic/sexual competition.

The failure of our primes to evoke measurable change in accuracy or bias when evaluating male sexual orientation illustrates that Euro-American women are simply unlikely to view gay men as romantic/sexual competitors (Chapter 2). This is because bisexual attraction and behaviour among Euro-American men is rare (Gates, 2011; Geary et al., 2018), and gynephilic men are sexually disinterested in the masculine presentation of androphilic (gay) males. This same pattern may not hold in all cultures, given that many androphilic males outside of Euro-American cultures present in a relatively feminine manner, adopt gender identities outside of the man/woman binary (Murray, 2000; Nanda, 2014; Whitam, 1997), and masculine men are more willing to engage in sexual behaviour with them (Pettersen et al., 2020; Whitam, 1992). Two prominent examples are the *fa'afafine* of Samoa, and the *muxes* among the Istmo Zapotec (Mexico), both of whom are widely recognized in their cultures and comprise ~2-6% of the male population (Gómez et al., 2018; Semenyna, VanderLaan, Pettersen, et al., 2017). Examining women's ability to detect male sexual orientation in these cultural locales would be highly informative, because feminine androphilic males are both commonplace and represent viable inter-sexual mate competition threats (Chapters 2 and 3). Samoan and Istmo Zapotec women may show especially accurate sexual orientation identification because *fa'afafine* and

muxes are more prominent and easily recognizable categories than Euro-American gay men. This would provide women in these cultures ample opportunity to observe the faces of androphilic males, and draw inferences about the probable sexual orientation of novel male faces. Such research would complement existing research showing that sexual orientation is legible across ethnic groups in the US (Johnson & Ghavami, 2011), as well as across cultures (Rule, Ishii, Ambady, Rosen, & Hallett, 2011).

Our failure to replicate any connection between women's ovulatory cycle and heightened ability to detect sexual orientation was unexpected given the strength of the original effect (Rule, Rosen, et al., 2011), where fertility (ovulation ratio) accounted for 21% of the variance in accuracy. We employed identical facial stimuli and rating procedure to the original study, as well as the same procedure for calculating fertility status. However, the present study used more stringent inclusion criteria that nonetheless resulted in a sample of naturally cycling women ($n = 379$) nearly 10-times larger than the original sample ($n = 39$). Our well-powered failure to replicate suggests that there is simply no connection between fertility status and legibility of sexual orientation. Changes in women's cognition, behaviour, and sexual preferences across the ovulatory cycle is a contentious research area, with substantial uncertainty around which effects are valid (Gildersleeve, Haselton, & Fales, 2014; Jones, Hahn, Fisher, Wang, Kandrik, & DeBruine, 2018; Jones, Hahn, Fisher, Wang, Kandrik, Han, et al., 2018; Stern, Gerlach, & Penke, 2020; Wood, Kressel, Joshi, & Louie, 2014). Additionally, most studies in this literature, including the present research, do not use objective assays of hormonal status or within-participant designs. Instead, they rely on backwards or forward counting methods, which are less reliable indicators of actual fertility, and between-participant designs that are lower in statistical power (Blake et al., 2016; Gangestad et al., 2016). It is possible that women do demonstrate

differential accuracy in detecting male sexual orientation across their ovulatory cycle, but limitations of our between-subjects design, and self-reported cycle information, hampered our ability to find such an association. This could be corrected in future research using within-subjects design involving multiple testing sessions, as well as hormonal assays to precisely determine fertility status.

Limitations

The present study has several prominent limitations. First, the convenience sample of undergraduate women limits our ability to apply the findings to other groups, although it should be noted that young women who are at or nearing peak reproductive age are a relevant sample for testing evolutionary hypotheses related to mate-selection and mate-competition. Although the images presently employed were standardized, and have been validated in numerous previous studies, participants used their own electronic devices to access study materials, potentially impacting our results. Completing study tasks in a lab setting may have altered results, including participant attention, although we employed numerous exclusions and attention checks to improve data quality. Additionally, no validity checks were employed to evaluate the plausibility of the newspaper articles used as primes. Perhaps the most obvious limitation of the current design is employing stimuli with an equal ratio of faces belonging to gay and heterosexual men. Such a design sacrifices external validity in the interest of internal validity, and sexual orientation accuracy levels within this and other similar studies should not be conflated with accuracy in naturalistic settings, which may be much lower (Gelman et al., 2018; Plöderl, 2014).

Conclusion

The present study represents a large-scale replication of women's ability to accurately detect male sexual orientation (Rule, 2017). Although this effect is well replicated, the exact mechanisms underlying women's ability remain elusive. The present results do not support inter-sexual mate competition as a likely ultimate explanation of this ability in a Euro-American context, and cast significant doubt on ovulatory-cycle leading to proximate shifts in women's ability to detect of male sexual orientation from facial cues.

Chapter 8: General Summary and Discussion

Inter-sexual mate competition occurs any time opposite-sex individuals engage in romantic/sexual competition over the same target individual (Vasey, Leca, et al., 2014). Chapter 1 detailed the ways in which inter-sexual mate competition in humans is likely to occur, particularly when a large percentage of individuals—usually men—engage in sexual behaviour with both females and males. The likelihood of inter-sexual mate competition is further heightened when androphilic males adopt non-binary gender identities, present themselves in a noticeably feminine manner, and successfully pursue (mostly gynephilic, i.e., Kinsey 1) men as sexual partners. Despite the possibility of inter-sexual mate competition occurring among humans, suggestive evidence for the phenomenon was patchy and necessarily weaved together from a variety of historical and ethnographic sources. The research presented in Chapters 2 through 7 redressed this using a mixed-methods approach incorporating qualitative studies, surveys, and experiments, and samples drawn from three distinct cultures: Canada, Samoa, and the Istmo Zapotec of Southern Mexico.

Chapter 2 examined the frequency and features of inter-sexual mate competition in two cultural locales where predominately gynephilic men regularly engage in sexual activity with feminine, third-gender males (Samoa and the Istmo Zapotec), as well as in a Euro-American context (Canada). In Samoa, 43% of women reported having ever experienced direct romantic/sexual competition against *fa'afafine*, and among women in the Istmo Zapotec, 85% reported inter-sexual mate competition against a *muxe*. Both rates were significantly higher than the prevalence of inter-sexual mate competition among Canadian women (15%). Importantly, women in both Samoa and the Istmo Zapotec generally treated *fa'afafine* or *muxes* as genuine romantic/sexual rivals and mate-poaching threats—a sharp contrast to the response of Canadian

women who did not take gay men seriously as inter-sexual mate competition rivals. This difference is sensible given that 12% of mate-poaching attempts by *muxe* in the Istmo Zapotec resulted in sexual activity with the target man, and 27% percent of mate-poaching attempts by *fa'afafine* in Samoa resulted in the same, whereas no Canadian women reported such an occurrence. This difference is attributable to the relative lack of bisexual attraction and behaviour among Euro-American men (Gates, 2011; Geary et al., 2018), as well as the fact that androphilic males in Canada typically identify as men and enact a masculine gender presentation, thereby being sexually unappealing to their gynephilic counterparts. The data reported in Chapter 2 represent the first systematic documentation of inter-sexual mate competition among humans, as well as the first study to characterize the way in which cultural differences in the frequency of male bisexual behaviour and the expression of male androphilia have downstream consequences on the rate of inter-sexual mate competition.

Building on this foundation, Chapter 3 examined Samoan and Istmo Zapotec women's response to both intra- and inter-sexual romantic/sexual rivals, using the same mixed-method qualitative framework applied in Chapter 2. This qualitative study not only showed that within-culture rates of intra- and inter-sexual mate competition were comparable, but that participant women tended to report similar mate competition tactics in the face of all romantic/sexual competitors, irrespective of whether their rival was a woman or feminine male. Considering the tactics attributed to rivals in these romantic/sexual competitions, the strategies employed by *fa'afafine* or *muxe* tended to mirror those of women within their own culture, although both Samoan and Istmo Zapotec women noted that feminine males were more sexually provocative and direct than women in these cultures could be. One important conclusion to be drawn from this research is that women show a generalized response to mate-competition rivals, which

applies in instances of either intra- or inter-sexual mate competition. This suggests that women's evolved tendencies to engage in certain mate competition tactics—such as enhancing their appearance to obtain mates, or retaining them with vigilance and emotional influence—are provoked by features of mate-competition more generally rather than being a unique set of behaviours to combat intrasexual or inter-sexual rivals specifically.

The findings of Chapters 2 and 3 are complemented by Chapter 4, which used data from three cultures to examine women's responses to hypothetical infidelity that was either heterosexual or homosexual in nature. The fact that many *muxe* and *fa'afafine* were successful in seducing target men (Chapter 2), indicates that this is not merely a hypothetical occurrence, at least in these milieus. Because only heterosexual infidelity poses a risk of conception, and men in both cultures frequently engage in sexual behaviour with feminine males, it was predicted that Samoan and Istmo Zapotec women would both show greater upset at heterosexual than homosexual infidelity. However, this prediction was only supported in Samoa. Istmo Zapotec women showed either equivalent upset to either type of infidelity (Chapter 4, Study 5), or *more* upset at the thought of their partner having a one-time sexual encounter with a *muxe* (Chapter 4, Study 6). Unlike Samoan women, who do not perceive men's sexual behaviour with *fa'afafine* as indicative of androphilia, Istmo Zapotec women tended to view sexual behaviour between men and *muxes* as a tacit indication that men themselves were androphilic. Canadian women's reaction to infidelity tended to be somewhat differentiated by age. Younger women in the two undergraduate samples (Studies 1 and 2), indicated greater upset at the thought of heterosexual infidelity, whereas the older community sample reported equivalently high upset at both infidelity types. Such a pattern could indicate that younger women are more focused on reproductively relevant concerns, and hence a reproductively viable rival, whereas older women

simply reacted to any threat to long-standing pair bonds. Alternatively, this could reflect generation differences in the perceptions of same-sex behaviour, with younger women interpreting this as an illustration of “sexual fluidity” or being open-minded, but older women assuming opposite- or same-sex attractions are binary and rigidly fixed.

Using an experimental design in three cultures, Chapter 5 examined partnered women’s trust in an individual interacting alone with her partner, with the potential mate-poaching threat randomly assigned to be either a reproductive threat (i.e., a heterosexual woman), or a non-reproductive threat (i.e., a gay man, *fa’afafine*, or *muxe*, depending on culture). Within-country comparisons showed that Canadian and Samoan women who were assigned to consider their partner interacting alone with a heterosexual woman reported elevated mistrust compared to women assigned to consider an androphilic male interacting alone with their partner. These patterns are consistent with those found in Chapter 4, wherein women in both cultures were most upset at the thought of heterosexual infidelity. Canadian women’s trust in androphilic males (i.e., gay men) is sensible given that rates of inter-sexual mate competition are low (Chapter 2), and rival women represent reproductively viable rivals (Chapter 4). As such, Canadian women’s trust in gay men likely flows directly from the fact that they find it difficult to imagine a gay man successfully poaching a gynephilic man from a heterosexual relationship, and envision a gynephilic man rebuffing such efforts (see also Davis-Delano, Kuchynka, Bosson, & Morgan, 2020). Samoan women’s relative trust in *fa’afafine* requires additional explication. This is because inter-sexual mate competition is relatively common in Samoa, as is *fa’afafine*’s successful seduction of men (Chapter 2), but such sexual activity does not appear to distress Samoan women as much as infidelity with another woman (Chapter 4). As such, the Samoan data from Chapter 5 may not indicate that women trust *fa’afafine per se*, so much as it indicates

that these women are less sensitive to the threat of *fa'afafine* rivals as compared to intrasexual ones. This would make a *fa'afafine* flirting with a partnered man, and his potential sexual activity with a *fa'afafine*, a minor transgression rather than an outright betrayal provoking the intense reactions to rival women observed in Chapters 4 and 5. Istmo Zapotec women reported high levels of mistrust in both other women and *muxes*.

The pattern of results among Istmo Zapotec women in Chapters 2, 4, and 5, are best considered holistically, given the possibility for confusion created by seemingly conflicting results. On the one hand, Istmo Zapotec women's mistrust in *muxes* (Chapter 5) makes sense given the frequency of inter-sexual mate competition in this culture (Chapter 2). However, many Zapotec women reacted to mate poaching attempts by *muxes* with little rejoinder. How do we square these findings with Istmo Zapotec women's strong reaction to the thought of their boyfriends/husbands engaging in sexual behaviour with *muxes* (Chapter 4)? First, these women know that *muxes* engage in high levels of flirtatious behaviour with men, likely driving the equivalent mistrust in a *muxe* or another woman interacting alone with their partners, in part because the questionnaire evaluated the degree to which participants believed the individual in question would flirt with their partner. Women's under-reaction to actual mate-poaching attempts by *muxe*, and very strong reaction to hypothetical infidelity with a *muxe*, are likely underpinned by the same assumption—believing their partners to be disinterested in such sexual activity, but distressed when confronted with the thought of its hypothetical occurrence. Although this assumption is perhaps naïve, given that many *muxes* did successfully seduce men in an appreciable number of mate-poaching situations, it explains the findings of Chapters 2, 4, and 5. In sum, many women react with little active mate competition when *muxes* attempt to poach their mates, because they presume their boyfriends/husbands will reject such advances

(Chapter 2). However, women know that *muxes* frequently (and provocatively) flirt with Istmo Zapotec men, thus displaying little trust in *muxes* interacting with their partners (Chapter 5). Last, if women's assumption that their partner is sexually uninterested in *muxes* turns out to be false, and sexual activity does indeed occur, this is met with a particularly negative emotional reaction (Chapter 4).

Chapters 6 and 7 utilized a substantially overlapping sample of Canadian undergraduate women to examine women's trust in androphilic males, as well as their ability to discern male sexual orientation from faces. Although Canadian women report low rates of inter-sexual mate competition (Chapter 2), the studies in Chapters 6 and 7 attempted to prime women to think of gay men as potential mate competition rivals. Women's general trust in gay men vis-à-vis their trust in other heterosexual women, and ability to detect male sexual orientation at levels above chance, were both replicated. However, neither experiment produced a priming effect to moderate these patterns. These null results are nevertheless instructive, inasmuch as they indicate that, 1) women can identify male sexual orientation with reasonable accuracy, and 2) often trust androphilic males to assist them (or at least not sabotage them) in acquiring and maintaining heterosexual mates. Culture heavily moderates the expression of male androphilia (Murray, 2000; Nanda, 2014), which in turn affects gynephilic males' willingness to engage in sexual activity with androphilic males (e.g., Petterson et al., 2016; Petterson et al., 2020; Whitam, 1992). Given that these requisite features are largely absent in Euro-America, it is perhaps no surprise that Canadian women could not be primed to think of gay men as potential romantic/sexual competitors.

Theoretical Implications of Inter-Sexual Mate Competition

Inter-sexual mate competition only occurs in some species (Vasey, Leca, et al., 2014), and is far from inevitable in many human cultures, but is nonetheless possible any time a sufficient number of individuals of one sex engage in sexual activity with both opposite- and same-sex conspecifics. This general prediction has been quantitatively demonstrated among Japanese macaques (*Macaca fuscata* Vasey, 1998), and now, humans. The present research has focused largely on inter-sexual mate competition between women and androphilic males, which appears especially common in the two non-Western cultures examined (Chapters 2 and 3). Although inter-sexual mate competition of this type was rare in Canada, it is likely that inter-sexual mate competition between men and gynephilic women will be more common in Euro-America. This is because a rather large proportion (10-15%) of women in these cultures identify as being “mostly-heterosexual,” reporting at least some attraction to same-sex individuals (i.e., Kinsey 1-3) (e.g., J. M. Bailey et al., 2016; Geary et al., 2018). Given the relative prevalence of these attractions, and that many “mostly-heterosexual” women engage in sexual behaviour with other women (e.g., Diamond & Alley, 2019; Legate & Rogge, 2019), inter-sexual mate competition in Euro-American contexts is most likely to involve competitions between (gynephilic) men and women for the same target woman. Future research could employ the same research strategy used in Chapters 2 and 3 to examine the prevalence of such contests, and their characteristics. Such a framework may be vital to understanding whether mostly-heterosexual or bisexual attractions among women are linked to increased, decreased, or no impacts on reproduction (e.g., Coome et al., 2020; Kuhle & Radtke, 2013; Luoto, Krams, & Rantala, 2019), are sexual strategies employed to entice men (Semenyna, Belu, Vasey, & Honey, 2017), or simply the result of motivations to seek sexual pleasure (Diamond & Alley, 2019).

The studies reported in Chapters 2 through 7 offer a first step in documenting inter-sexual mate competition among humans, as well as investigating some possible consequences of such contests. Inter-sexual mate competition inherently involves a competitor who is reproductively viable if successful, and one who is not. Because these studies were guided by a sexual selection framework (Darwin, 1871; Janicke et al., 2016), we focused on women, given that only sexual interactions between women and the men they desire could be reproductive. Future studies should examine inter-sexual mate competition from the perspective of the non-reproductive competitors, in this case androphilic males. Targeted sampling of minority populations would produce inflated estimates of inter-sexual mate competition, because these individuals are more likely to *initiate* such interactions, but such research could nonetheless triangulate the findings of Chapters 2 and 3 regarding the tactics employed in such contests. Additionally, research could be undertaken to understand androphilic male's trust in friendships with women, as well as their potential motivations for befriending heterosexual women and heterosexual men. Some research has found that the number of gay men in a woman's friendship circle is correlated with her objectively rated beauty (Russell, Babcock, et al., 2018). It is possible that androphilic males preferentially befriend beautiful women because such women are likely to attract more desirable (gynephilic) men, which could increase gay men's self-esteem (including feelings of masculinity), and value on the "gay mating market" if they are seen in the company of attractive straight men. Similarly, gay men may befriend men whom they find particularly attractive, and even attempt to curry favour with these desirable men by introducing them to attractive women. These are among numerous potential avenues for future investigation.

One area of potential research pertaining to romantic/sexual competition between women and androphilic males, the Operational Sex Ratio, was not presently examined. Operational Sex

Ratio (OSR)¹⁴ is typically defined as the proportion of males to females who are available in the mating pool at any given time (e.g., de Jong et al., 2012; Marlowe & Berbesque, 2012; Schacht & Borgerhoff Mulder, 2015). Biased sex ratios are predicted to produce intensified mate-competition among the more plentiful sex, who are subsequently more likely to capitulate to the preferred mating-strategies of the rarer sex (Durante, Griskevicius, Simpson, Cantu, & Tybur, 2012; Weir et al., 2011). For example, when males are less abundant, country-level OSR is related to higher rates of teenage pregnancies (Barber, 2000), in part because females are more willing to engage in sexual strategies typified by less investment and commitment from males. Conversely, when females are less plentiful in a local mating ecology, males display more willingness to engage in long-term partners and investment in offspring in order to successfully attract and retain female partners (e.g., Schacht & Smith, 2017). Polygynous practices can even artificially manipulate the OSR, forcing lower-status men to compete intensely for status and resources in the hopes of establishing their own polygynous unions, such as among Iron Age Vikings (Raffield, Price, & Collard, 2017). Although the calculation of OSRs typically involves reproductively viable males and females in a local population, the presence of high rates of inter-sexual mate competition in certain cultures is an unexplored factor in these dynamics.

Rather than thinking of OSR as simply representing the number of reproductively available and viable males and females, one could instead envision androphilic males as impacting these ratios. In Euro-American contexts, the 2-4% of exclusively androphilic males who are (likely) to identify as gay men (J. M. Bailey et al., 2016) are exterior to the OSR

¹⁴ Other sex ratios also exist, including the Sex Ratio at Birth, the Adult Sex Ratio, and even the Physiological OSR, which accounts for women who are in the mating pool but not currently fertile due to menstrual cycle or pregnancy (A. K. Hill, Bailey, & Puts, 2017). These ratios are intercorrelated, but distinguishable. The OSR is chosen here, because individuals in the reproductive pool are most likely to both impact and be impacted by mating-market forces.

inasmuch as they are unlikely sexual partners (or competitors) for heterosexual men or women. The same is not true of cultures such as the Istmo Zapotec, or in Samoa, where *muxes* and *fa'afafine* represent ~2-6% of the male population (Gómez et al., 2018; Semenyna, VanderLaan, Petterson, et al., 2017). These males are not simply *removed* from the male portion of the OSR¹⁵ calculation, but *added* to the “female” portion, because they simultaneously represent viable (feminine) sexual partners for gynephilic men *and* (inter-sexual) mate competitors for androphilic women. In this way, a small number of feminine androphilic males can have a disproportionate effect on the OSR, in turn impacting women’s mating psychology and mate-competition motivation. Experimental research in Euro-America has shown that women primed to think of OSRs indicative of excess females show greater willingness to engage in casual sexual behaviour (Moss & Maner, 2016). A more naturalistic test of this pattern could occur in locales where feminine androphilic males are commonplace. In Samoa, for example, this line of reasoning would lead to the prediction that women who live in villages where more *fa'afafine* reside will show greater willingness to engage in casual sexual behaviour (i.e., less restricted sociosexuality) than women who live in villages with few or no *fa'afafine*. Alternatively, this logic would also predict a positive correlation between Samoan or Istmo Zapotec women’s sociosexuality, and the number of *fa'afafine* or *muxe* friends she has. Research on OSRs, as well as mating dynamics more broadly, could be refined by the recognition of inter-sexual mate competition when it does occur.

¹⁵ An “Operational Gender Ratio” (OGR) may be more appropriate in this context, as it would capture the number of reproductively active men as a proportion of available feminine partners (i.e., both androphilic women and third gender males).

Conclusion

Although this constitutes the final chapter of this dissertation, it is merely the first small step in understanding inter-sexual mate competition among humans. Some researchers have already begun asking questions such as how heterosexual people respond to romantic or sexual overtures from same-sex individuals (Davis-Delano et al., 2020). Additionally, the largest group of sexual minority individuals in Euro-American contexts are those who are “mostly-heterosexual,” (i.e., Kinsey 1 or 2) representing up to 5% of men, and 10% of women (J. M. Bailey et al., 2016; Morandini et al., 2019; Savin-Williams & Vrangalova, 2013). The mere existence of so many individuals who will purportedly engage in bisexual behaviour makes inter-sexual mate competition inescapable, although these authors do not discuss this important possibility. Now that inter-sexual mate competition has been documented among humans, it offers a refinement to sexual selection theory (Darwin, 1871), and a new lens through which to observe mate competition *between* males and females. As repeatedly noted in the previous chapters, many historical and contemporary instances of inter-sexual mate competition have likely gone misunderstood, dismissed as trivial, or entirely unnoticed. This may be attributable to the fact that most researchers are from Euro-American nations, and focus on their own cultures where inter-sexual mate competition has been historically rare, further underscoring the importance of conducting comparative, cross-cultural research. Albert Einstein opined that “it is theory which decides what we can observe” (Heisenberg, 1971, p. 63), and it is now time for inter-sexual mate competition to colour the frameworks through which we view mating behaviour. This will guide not only more observations of the phenomenon, but provide a foundation on which to understand the consequences of inter-sexual competition on the mating

dynamics of humans and non-human animals. Now that this thread has been identified in the tapestry of human behaviour, it must be pulled to see where it leads.

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APPENDIX 1: Mate Competition Tactics Coding Key Used in Chapters 2 and 3

Target Manipulation	
DG (Direct Guarding)	Physically interposing oneself between target and competitor (put in physical space, not violence against competitor).
V (Vigilance)	Any act that is aimed at monitoring the behavior of the target (e.g., spying on target, call to check on, checking cell phone, snoop through belongings, etc.).
C (Concealing Target)	Any act aimed at not allowing the target and competitor to interact. (e.g., take target away from gathering, or avoid going altogether).
M (Monopolize Target)	Any act aimed at not allowing target to interact with others (e.g., monopolizing time, money, attention, interrupting competitor's attempts to interact with target)
Negative Inducements	
Jl (Jealousy Induction)	(Infidelity Threat) Any act that involves threatening to begin or pursue sexual or romantic relationships with someone other than the target. (e.g., talk to someone else to make target jealous).
PTI (Punish Targets Threat of Infidelity)	Any negative reaction to the target beginning or pursuing a sexual or romantic relationship with another party (e.g., become angry when target flirts with others, threaten to break up if target cheats).
EM (Emotional Manipulation)	Any act aimed at making the target feel guilty (or negative) about not pursuing a relationship with the target, or about pursuing or beginning a relationship with the competitor. (e.g., "I can't live without you.")
CM (Commitment Manipulation)	Any act aimed at increasing the level of commitment between the individual and the target (e.g., demand total commitment, ask to marry).
D (Derogation of Competitor)	Any statement made toward the target that downgrades the competitor (e.g., calling the competitor ugly, a slut, not taking the competitor seriously, point out flaws). Derogation of physical attractiveness, personality traits, sexuality (e.g., "slut" or "bad in bed," etc.), or general gossip (i.e., character attack).
Positive Inducements	
RD (Resource Display)	Any offer or provisioning of material resources (e.g., money, food, drinks, gifts) toward the target (buying gifts, food/drinks, displays of resources such as cars or expensive possessions).
SI (Sexual Inducements)	Offering sex to the target, behaving in manners that are sexually suggestive, acting sexy, performing sexual favors for the target, making appeals to target's sexual interests. These can be conceptive (SIC) or non-conceptive (SINC).
AE (Appearance Enhancement)	Any act that is aimed at increasing physical attractiveness, in terms of physical appearance, when in the presence of target, or when expecting to be in the presence of the target (e.g., wearing nice clothes/jewelry, being well groomed, physical betterment via exercise, etc.).
LC (Love and Caring emphasis)	Any act (verbal or non-verbal) that signals the individual loves or cares for the target (e.g., compliments, listening to their problems, taking interest in their lives, saying they love the target, displaying affection).
SD (Submission and Debasement)	Doing or implying that the individual will do anything that the target asks of the individual. Putting own interests aside so the target gets his or her way. (E.g., "I went along with everything my partner/target said.")

DC (Direct Contact—Proceptive Behavior)	Any non-sexual act that is aimed at encouraging future interaction (e.g., flirting, smiling, play with own or target’s hair, brush target’s arm, making the target feel at ease, seductive dancing).
PA (Personality Advertisement)	<i>Emphasize personal attributes</i> : Demonstrating or discussing personal abilities to appear more attractive (e.g., showing off positive attributes such as caring, helpful, nice, friendly, etc.).
GA (Gain Access)	Gaining Access: Any act aimed at facilitating opportunities to interact with target, as well as taking opportunities to interact with target (\neq <i>Capitalizing on Opportunities</i>).
Competitor Manipulation	
Signal Possession	
VPS (Verbal Signals of Possession)	Any verbal declaration in the presence of the target or competitor that suggests the target and individual are in a relationship (e.g., “bragged about relationship with target” or “told other that they and target were in love”).
PPS (Physical Signals of Possession)	Any physical act that suggests the target and individual are in a relationship (e.g., put arm around the target, kissed the target in front of others, holds targets hand in public).
PO (Possessive Ornamentation)	When individual gives target an item that indicates they are in a relationship (e.g., ring, or other jewelry)
Negative Inducements	
DT (Derogate Target to Competitors)	Degrading the target in some way to the competitor (e.g., tell other that target is “a pain,” or putting down target).
TC (Threaten Competitor)	(Intrasexual threats to other taxonomies): Threatening the competitor to induce the competitor to cease competing (e.g., glaring at competitor).
VR (Violence against Rival)	Any violent act directed toward the competitor (e.g., pushed, hit, kicked, or slapped rival).
DA (Direct Action)	Intimidating Competitor (Direct action): Any act suggesting to competitor that the competitor will lose (e.g., betting in favour of self to win the competition). Also, exhibiting anger toward competitor. Bully, intimidate, or confront rival.
(CO) Capitalize on Opportunity	Waiting for opportune moments (e.g., when competitor is absent) to approach the target.
(CS) (Coalitional Strategies).	Strategies of using coalitions to either retain or attract mate. These can employ any combination of the above strategies (e.g., vigilance, intimidation, verbal signs of possession, etc.). Any strategy that uses an existing alliance to either retain or attract a mate will be coded as a Coalitional Strategy. Code as CS: then indicate which type of strategy the ally employed (e.g., CS:V)
Strategy Matching	Either a competitor (or the participant) reporting engaging in the same behaviour <i>after</i> their competitor does so (e.g., competitor 1 engages in flirting or seductive dancing, so competitor 2 does the same).

APPENDIX 2: Mate Retention Trust Questionnaire Used in Chapters 5 And 6

Imagine that you and your boyfriend have recently been invited to a party. It is the night of the party and you become ill. However, a heterosexual woman/gay man/*fa'afafine/muxe/* [depending on study site and randomly assigned condition] who is your neighbour offers to go to the party with your boyfriend. This person is 25 years of age and single. Your boyfriend decides to go to the party with your neighbour, while you stay home sick.

Please Rate the questions below using on the following scale

1 – Very Unlikely 4 – Neither Likely nor Unlikely 7 – Very Likely

- 1) How likely is it that your neighbour would flirt with your boyfriend/husband at the party?
- 2) How likely do you think it is that you would warn your boyfriend to not trust the intentions of your neighbour?
- 3) How likely is it that your neighbour would gossip with your boyfriend/husband about you, possibly saying untrue things about you?
- 4) How likely do you think it is that your neighbour would try and convince your boyfriend/husband that “It wouldn’t really be cheating” if they were to have sex?
- 5) How likely do you think it is that your neighbour might try and convince your boyfriend/husband that they are better at sex than you?
- 6) How likely is it that the neighbour would put *extra* effort into their appearance after finding out that you won’t be coming to the party with your boyfriend/husband?
- 7) How likely is it that you would call your boyfriend/husband at some point during the night to “check-in” with him?
- 8) How likely do you think it is that the neighbour may get your boyfriend/husband drunk in order to seduce him?
- 9) How likely is it that you would text someone you know at the party to ask them what your boyfriend/husband is doing?
- 10) Which statement most likely describes the sexual feelings of the neighbour in the last year?
 - a) Only sexually attracted to men
 - b) Only sexually attracted to women
 - c) Sexually attracted to both men and women

APPENDIX 3: Mate Acquisition Trust Questionnaire used in Chapter 6

Imagine that you have recently been invited to a party by your friend. It is the night of the party and your friend becomes ill. However, they suggest you attend the party with one of their neighbours, a *fa'afafine/muxe*/gay man/heterosexual woman [depending on study site and randomly assigned condition] who is 25 years of age and single. You do not know this person, but you decide to go to the party with them anyway.

Please Rate the likelihood that you would trust your acquaintance's advice on the following scale

1 – Very Unlikely 4 – Neither Likely nor Unlikely 7 – Very Likely

- 1) Imagine that you have already picked out an outfit to wear for the party. However, your friend's neighbour offers you a second opinion and tells you to wear something else instead. How likely are you to follow the advice of your acquaintance?
- 2) How likely are you to see advice received from your acquaintance as trustworthy?
- 3) Imagine that you try on something different, and your acquaintance compliments you on your appearance. What is the likelihood that they are being sincere?
- 4) Before you arrive at the party, imagine that your acquaintance provides you with information about the men that are going to be there. How likely are you to trust this information?
- 5) How likely would you be to trust your acquaintance to tell you that you have something stuck in your teeth before talking to an attractive man at the party?
- 6) Imagine that this attractive man at the party starts flirting with you. He seems really nice and is really interested with what you have to say. However, your acquaintance later tells you that, "He isn't really interested in you." How likely would you be to trust your acquaintance?
- 7) When your acquaintance tells you about the man, they say to you, "I don't think he is your type anyway, but you should talk to his friend who he came with—he seems great." However, you find his friend unattractive. How likely would you be to trust this advice?
- 8) How likely would your acquaintance be to offer you trustworthy information about the availability of other men at the party?
- 9) Which statement most likely describes the sexual feelings of the neighbour in the last year?
 - a) Only sexually attracted to men
 - b) Only sexually attracted to women
 - c) Sexually attracted to both men and women

APPENDIX 4: Primes Used in Chapters 6 And 7

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Night Owls Have More Nightmares, Study Claims

By: Alexis Dale
The Associated Press Posted: Aug 30, 2016, 3:23 PM ET



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The early bird might catch the worm because it sleeps better than the night owl, not just because it awakens earlier.

At least that appears to be the case for humans, according to a new study. Researchers found that night owls ("evening-type individuals") are significantly more likely to suffer from poor sleep quality, daytime sleepiness, and disturbing nightmares than early birds ("morning-type individuals") or folks whose bedtime falls somewhere between the two. "Evening-type people have more nightmares because of their sleep patterns," says lead author Yavuz Selvi, assistant professor of psychiatry at Yuzuncu Yil University in Van, Turkey, whose paper was published online Aug. 25 in the journal, *Sleep and Biological Rhythms*.

Staying awake late at night and waking up late in the morning disrupts the relationship between the body's internal clock and its ability to maintain normal sleep patterns, Selvi explains.

In other words, it really screws up your circadian rhythm. Nightmares usually awaken you, so if they occur frequently, you might begin to fear falling asleep, cutting into your snooze time even more. Epidemiological studies have found that nearly nine in 10 adults reporting having at least one nightmare in the

Evening-type people have more nightmares
— Yuvaz Selvi, Yuzunca Yil University

- Full Paper in *Sleep and Biological Rhythms*

previous year, Selvi says, with 2–6% reporting weekly nightmares. He and his co-authors studied 264 medical students, ages 17 to 26 years old, who weren't yet dealing with crazy hours in their training. The researchers administered a battery of tests to assess whether the students were morning or evening types, the quality of their sleep and how frequently they experienced nightmares and how disturbing they were.

The tests revealed that 59 of the students were evening types, 67 morning types and the rest fell in the "intermediate" range. Men were more likely than women to be night owls; vice versa when it came to early birds.

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Figure A4.1. Control Prime used in Chapters 6 and 7

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Canadian Men Increasingly Open to Same-sex Encounters, Study Claims

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- Full Paper in *Proceedings of Sex Research*
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Single women may have an even more difficult time finding eligible men on Canadian university campuses, according to new research.

Statistics Canada shows that women already make up 60% of the student population at Canadian universities, and a new study suggests that men in their cohort are increasingly willing to engage in sexual activities with other men. "An unprecedented shift in the last decade indicates that Canadian university men are engaging in homosexual behavior at higher rates than ever before," says lead author, Dr. Doug Chalborn, an Assistant Professor in the University of Toronto Psychology Department. An excerpt from the study, published in August in the *Proceedings of Sex Research*, states that "the most recent anonymous survey numbers indicate that up to 27% of heterosexually identified men on Canadian University campuses are regularly engaging in sex with other men, even choosing male over female partners."

Men are engaging in homosexual behavior at higher rates than ever — Doug Chalborn, University of Toronto

Epidemiological studies have established that the rate of exclusive homosexual attraction in males falls somewhere between 2-4%. So why the puzzling explosion of male homosexual behaviour on Canadian university campuses among men who don't identify as gay?

- Full Paper in *Proceedings of Sex Research*

The authors speculate that these shifts are due in large part to the greater acceptance of alternative sexualities and lifestyles in recent years. This acceptance has kick-started a "second sexual revolution" where university aged men are more willing to explore and experiment with their sexuality. One participant in the study is quoted as saying "my university experience opened my eyes to the fact that I might enjoy sex with men—I'm still attracted to women, but I prefer to be in a relationship with a man right now." Lucy, a frustrated local university student stated: "everywhere I go, all the men just seem to be interested in each other."

This new data shows that university aged men are increasingly seeking out not only homosexual encounters, but relationships. With on-campus sex ratios already skewed towards far more females than males, this trend indicates a recent shift that may not bode well for single University women seeking boyfriends.

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Figure A4.2: Experimental Prime for Unpartnered Women in Chapters 6 and 7

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Canadian Men Increasingly Leaving Heterosexual Relationships Behind

By: Alexis Dale

The Associated Press Posted: Aug 30, 2016, 3:23 PM ET



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“Men are leaving their long-term female partners for other men at an unprecedented rate” claims a recent study published in the *Proceedings of Sex Research*.

The study, led by University of Toronto professor, Dr. Doug Chalborn, has unearthed a recent trend of heterosexual men abandoning their relationships with women, and instead choosing to date men. “It seems like these men are discovering that they’re increasingly open to relationships with men, and in many cases report choosing to end their relationships with women to pursue those interests,” said Dr. Chalborn.

The longitudinal study tracked 437 Canadian heterosexual couples across three consecutive years. Results showed that while 23% of relationships lasted all three years, a nearly equal (and surprising) number of relationships (21%) ended because men left their girlfriends for other men. “The results weren’t anticipated at all,” says Chalborn, “but show that men in the modern world are increasingly shedding their historic resistance to forming sexual and romantic bonds with other men.”

Men are discovering that they’re increasingly open to relationships with men
— Doug Chalborn, University of Toronto

- Full Paper in *Proceedings of Sex Research*

The researchers followed up with some of these men in order to understand what motivated them to walk away from their heterosexual relationships. “I didn’t really think much about it until I had had a few drinks one night at a party, and a gay acquaintance kissed me,” said one participant, “but since then I haven’t really looked back.” Another participant mentioned how much easier he found it to be in a relationship with a man, saying: “my old girlfriend and I fought a lot because we were never communicating on the same page, but now my boyfriend and I just click, ya know?”

This research reflects what the authors are calling a “new era” in modern dating, where all the old rules are being thrown out the window. Sexually liberated men are embracing new dating options with other men like never before, leaving many women bewildered by the harsh reality of the new sexual landscape.

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Figure A4.3: Experimental Prime for Partnered Women in Chapters 6 and 7