



The evolution of female same-sex attraction: The male choice hypothesis



Menelaos Apostolou*, Marios Shialos, Michalis Khalil, Vana Paschali

University of Nicosia, 46 Makedonitissas Ave., 1700 Nicosia, Cyprus

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ABSTRACT

Prevalence studies indicate that about one in five women experience some degree of same-sex attraction. The evolutionary origins of such attraction are not well understood. Accordingly, this paper proposed a theoretical framework where, during the period of human evolution, same-sex attractions in women were under positive selection. The source of positive selection has been male preferences for opposite-sex sex partners who experienced same-sex attractions. This theoretical framework was used to generate four predictions that were tested in two online studies which employed a total of 1509 heterosexual participants. It was found that heterosexual women did not desire partners who experienced same-sex attractions, but a considerable proportion of heterosexual men desired partners who experienced same-sex attractions. In addition, it was found that men were more sexually excited than women by the same-sex infidelity of their partners, and they desired more than women, their opposite-sex partners to have sex with same-sex individuals. Finally, participants' preferences were contingent on the seriousness of the relationships, with same-sex attraction to be preferred more in short-term than in a long-term partner. These findings were employed in understanding the evolutionary origins of same-sex attraction in women.

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1. Introduction

Humans are a sexually reproducing species, which means that, in order to procreate, people need to gain access to the reproductive capacity of the opposite sex. Accordingly, selection forces have shaped attractions to motivate individuals to seek sexual contact with opposite-sex partners. As a consequence, the vast majority of individuals are attracted exclusively to members of the opposite sex (LeVay, 2010). What this evolutionary reasoning does not explain, however, is that a significant proportion of individuals experience attraction toward the same sex (LeVay, 2010; Santtila et al., 2010). There have been several theoretical and empirical attempts to account for the evolutionary roots of this phenomenon, most of which focused on exclusive or nearly exclusive same-sex attraction in men (for a review see Bailey et al., 2016; LeVay, 2010). Even so, large scale studies of sexual orientation indicate that same-sex attraction is much more common in women than in men, while heterosexual orientation with same-sex attraction is much more common than homosexual orientation.

In particular, about 3–8% of men and 14–15% of women are heterosexuals but experience attraction toward the same sex, about 0.5–5% of men and 2–4% of women are bisexual, and about 2–5% of men and 1–4% of women are homosexuals (Calzo, Masyn, Austin, Jun, & Corliss, 2017; Dickson, Paul, & Herbison, 2003; Savin-Williams, Joyner, & Rieger, 2012; Yougov report, 2015). Therefore, women who experience some degree

of same-sex attraction are almost double (20%) the amount of men who experience such attraction (12%). There has been a recent interest in understanding the evolutionary origins of same-sex attraction in women (Kanazawa, 2016; Kuhle & Radtke, 2013), one example being the weak selection pressures hypothesis (Apostolou, 2016a). The purpose of this work is to extend the theoretical framework of the weak selection pressures hypothesis, by arguing that male choice is likely to have been one of the main contributing factors in the evolution of female same-sex attraction. The proposed evolutionary framework is subsequently employed in deriving several predictions, with the purpose of understanding the evolutionary roots of same-sex attraction in women.

2. The weak selection pressures hypothesis

New alleles can arise from mutations. An allele's influence on a trait is likely to have both negative (c) and positive (b) fitness effects; thus, the allele will increase in frequency if the balance of positive minus negative fitness contribution (b – c) i.e., the net fitness effect (f), is higher than the respective balance of the original gene, and it will decrease in frequency if the balance is negative. Please note that we refer here to the case averaged across all bearers of the allele, so that an allele will be favored even if it has a net negative effect on the fitness of some individuals as long as it has a net positive effect on the fitness of other bearers of the allele.

At first sight, alleles that arise through mutation and predispose for same-sex attraction appear to experience a substantial negative fitness, since they lead individuals to divert part or the whole of their mating effort toward same-sex outlets from which children, who would carry

* Corresponding author.

E-mail address: m.apostolou@gmail.com (M. Apostolou).

these alleles, cannot be borne. Accordingly, in order to understand the prevalence of same-sex attraction in the population, scholars have argued that these alleles also experience positive fitness effects, which compensate for the negative fitness effects, turning the net fitness (f) positive (Bailey et al., 2016; LeVay, 2010). There is, however, a different possibility.

In particular, the rate at which selection forces remove mutant alleles from the gene pool depends on the size of the negative fitness effect: The larger the effect, the faster selection forces remove alleles from the gene pool. Assuming a positive mutation rate, at any point in time, it is expected that there would be a few alleles that predispose for same-sex attraction. If their net negative fitness effect is very high, selection forces would quickly remove them from the gene pool, so their frequency across time would remain very low. However, if their net negative fitness effect is low, then their frequency would be higher, as selection forces would not remove them from the gene pool as quickly. The weak selection pressures hypothesis proposes that, during the period of human evolution, the fitness cost (c) for alleles that predispose for same-sex attraction in women had been low, resulting in the relative high prevalence of female same-sex attraction observed today (Apostolou, 2016a).

In more detail, anthropological and historical evidence indicates that, in ancestral human societies, mate choice was regulated, with parents choosing spouses for their children, rather than children choosing for themselves, with the grip of parental control over mating being stronger on daughters than on sons (Apostolou, 2012, 2014). Regulation of mating considerably decreases the negative fitness effect of same-sex attraction (c), as women, irrespective of their sexual orientation, would find themselves married to opposite-sex partners.

Although there are good reasons to believe that negative selection pressures on the alleles that predispose for same-sex attraction in women had been weak, this is probably not the whole story behind the evolution of same-sex attraction in women. In particular, the high prevalence of same-sex attraction in women hints that it may not be solely because of mutation selection, even if a multiplicity of genetic factors are involved (Gavrilets & Rice, 2006). This is also hinted by recent evidence that men find the same-sex attraction of their opposite-sex partners sexually exciting (Apostolou, 2016b). There are reasons to believe that such positive selection would come from a male preference for same-sex attraction in heterosexual women.

3. The male choice hypothesis

Fertilization of the egg and gestation take place inside women's bodies, which results in women giving birth to children with certainty that they are their own. This certainty is not shared, however, by men who cannot be sure that the children that their partners give birth to are actually their own. Paternal uncertainty gives rise to considerable selection pressure on men to evolve mechanisms that would enable them to reduce the risk of cuckoldry (Buss, 2000, 2017). It has been argued, for instance, that jealousy that motivates aggressive behavior toward a partner, is a mechanism that has evolved to serve this purpose. By imposing a heavy cost on their partners for infidelity, men discourage them from cheating (Buss, 2000; Goetz, Shackelford, Romero, Kaighobadi, & Miner, 2008).

Another cuckoldry-protection mechanism may be a male preference for female partners who experience same-sex attraction. In particular, if a man's opposite sex partner has sex with another woman, this act does not increase his risk of being cuckolded, since such a contact does not lead to conception. Actually, same-sex infidelity may reduce this risk: A woman, driven by her sexual desires, may seek sexual contact outside her long-term intimate relationship. There may be many reasons for doing so, including her partner not being able to satisfy her sexually because he is absent, ill, or no longer sexually attracted to her. When this woman has sex with another woman, she does not have sex with another man, which translates into same-sex contact reducing the risk of cuckoldry by diverting women's urges toward non-reproductive outlets.

As men cannot always guard their partners, and because, they cannot always impose heavy costs on them if they cheat - they are limited for instance, in using physical punishment, due to the risk of retaliation from women's parents - they are always vulnerable to cuckoldry. Accordingly, female attraction toward the same-sex can be useful for men as a protection against cuckoldry, especially when they cannot protect themselves through other means. In addition, such same-sex attraction can be particularly beneficial for men who marry polygynously, a practice which is common in pre-industrial societies (Zeitzen, 2008). Men with multiple wives, as opposed to men with one wife, face an elevated probability to be cuckolded, because they have to divide their sexual effort toward several wives so, inevitably, some of their wives will remain unsatisfied. They also have to divide their mate-guarding effort between multiple wives, which makes such effort less effective. If their wives experience same-sex attraction, they can satisfy their urges with other co-wives, who are readily available, reducing, in effect, the risk of cuckoldry (see also Kanazawa, 2016).

Another benefit that a man can accrue from an opposite-sex mate who experiences same-sex attraction can be to gain access to other women. In particular, if a man's partner has sex with another woman, there is an elevated probability that he gains also sexual access to this other woman. In this respect, the same-sex attraction of his partner constitutes a window of opportunity for a man to have sex with other women without much mating effort, as this effort is made by his partner. Overall, there are at least two possible benefits that men can derive from having opposite-sex partners with same-sex attractions, namely a reduced risk of cuckoldry and an elevated probability to gain access to the reproductive capacity of additional women without much mating effort.

Positive mutation rate combined with weak selection pressures on alleles that predispose for same-sex attraction in women, would result in the emergence of several ancestral women who experienced same-sex attraction. The presence of these women, along with the positive fitness effects of same-sex attraction, would exercise selection pressure on men to prefer these women as partners. That is to say, such preferences would enable men to direct their mating effort toward having such women as partners, since doing so would increase their fitness due to lower risk of cuckoldry. Because same-sex attraction is not readily observed, it is unlikely to constitute a selection criterion in initial choice, and is expected to be predominantly manifested within the context of a relationship. *Ceteris paribus*, men would be less likely to divorce (if the relationship takes the form of marriage), mistreat, or cheat on, and would be more likely to treat well and favor women with same-sex attraction, as opposed to women without such attraction.

If such male preference increases sufficiently in the population, the positive fitness effect of the alleles that predispose for same-sex attraction in women (b) would increase. Women who experience same-sex attraction would be likely to experience fitness benefits coming predominantly from better relationships with their partners. Thus, positive selection would be exercised on alleles that predispose for same-sex attraction in women, resulting in their frequency in the population to increase.

The male choice hypothesis put forward here is not opposed to the weak selection pressures hypothesis but complementary to it. The weak selection pressures hypothesis examines the fitness cost (c) aspect, while the male choice hypothesis focuses on the fitness benefit (b) aspect of same-sex attraction. A combination of the two hypotheses provides a more comprehensive theoretical framework for understanding the evolution of same-sex attraction in women. The hypothesis that ancestral men derived fitness benefits from having as mates women who experienced same-sex attractions generates several predictions that will be explored next.

4. Predictions on same-sex attraction

In the evolutionary framework developed above, the same-sex attraction of an opposite-sex partner is beneficial for men because it

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