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## EVOLUTIONARY PERSPECTIVE OF SAME-SEX SEXUALITY: HOMOSEXUALITY AND HOMOSOCIALITY REVISITED

*ABSTRACT: From the evolutionary point of view homosexual orientation is a puzzle because same-sex sexual preferences significantly reduce individual reproductive success. In this paper, we reconsider two theories explaining human homosexuality as an extreme of an adaptive trait of bisexuality, and as a by-product of another adaptation which consists in a more general shift of males toward feminine characteristics. In line with these theories, we discuss the issue of male bisexuality, and concept of female fluidity of sexual preferences. Based on the theories, we argue, that opportunistic homosexuality may be adaptive for both men and women within certain social contexts, or in specific periods during individual ontogeny, even if not through direct increase of individual reproductive success. We propose that same-sex sexuality and/or preferences can appear at specific periods during individual's ontogeny, when same-sex alliances would be advantageous for the individual. Based on our arguments, optimal strategy might be an opportunistic one. Thus, if there is a suitable opportunity, the gender of the sexual partner does not matter when it leads to gaining some benefits (for example resources, territories, or even own reproductive advantages). In other words, if homosexual (as well as heterosexual) behaviour serves a social function for gaining some benefits, or for lowering aggressiveness and clarification of same-sex hierarchy, the activity with the person might be more important than the gender of the person itself. Thus, motivation for such activities might then be more social rather than sexual.*

*KEY WORDS: Sexual orientation – Sexual behaviour – Bisexuality – Homosexuality – Homosociality*

### INTRODUCTION

A large number of scholarly papers have explored possible evolutionary origins and adaptive values of mate preferences and mate choices among heterosexual

individuals. From an evolutionary perspective a primary function of any long-term mixed-sex relationship is to produce and nurture offspring to their sexual adulthood. Long-term relationships appears in species with highly dependent offspring (Salmon, Shackelford 2008).

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However, same-sex couples, that is, pairs of two men or two women, have significantly fewer children than heterosexuals (Kurdek 2005), thus such a pairing system significantly reduces individual reproductive success. Yet, sexual relations between individuals of the same gender have been frequently documented across the whole array of non-human species (Roughgarden 2009), human populations, cultures, and historical periods. Occasional homosexual behaviour and also stable homosexual orientation has been documented by many anthropologists around the world (e.g., Bhugra *et al.* 2010, Ford, Beach 1951, Herdt 1997 Sommer, Vasey 2006).

Nevertheless, before discussing possible aetiology (including the ultimate, evolutionary causes), any studied trait needs a precise definition and description. Unfortunately, the concept of sexual orientation represents rather a vague category including behaviours, or preferences of individuals of the same sex, while these concepts might differ not only between different cultures but also between individual researchers, i.e., from both emic and etic perspective. Thus, when we talk about homosexual orientation, we will use the following definition: homosexually orientated is an individual whose imagination, affections, and desires focus exclusively or at least from a major part on individuals of the same sex (i.e., homosexual preference), but their preference may or may not be manifested outwardly (i.e., homosexual behaviour) and he or she even may not be identified as gay/lesbian (i.e., homosexual identification) (Valentová 2004).

From the evolutionary perspective it is not clear why is homosexual orientation maintained in the population if it provides lower individual reproductive success. However, it is suggested that although same-sex sexuality does not promote direct reproduction of individuals, it may have, from the evolutionary perspective, some other adaptive benefit. There are several theories trying to explain the evolutionary roots of exclusive homosexuality, and they vary in the degree of received empirical support. Some theories explain human homosexuality as an adaptive trait, e.g., from the perspective of inclusive fitness promoted by kinship altruism (Wilson 1975). According to this theory, homosexual individuals increase their inclusive reproductive success by taking care of their siblings and other relatives with whom they share a large number of genes (Wilson 1975). However empirical evidence for this theory is rather mixed (Bobrow, Bailey 2001, Hewitt 1995, Vasey *et al.* 2007). Another theory suggests that male homosexuality is a result of sexually antagonistic

genes, which promote fecundity and reproductive success in females, but decrease reproductive success in males. This theory has been supported by studies showing that genetic component of male sexual orientation runs in families, is more frequent on the maternal side (Hamer, Copeland 1994), and females who have a homosexual son or other homosexual male relative have higher number of offspring, and report earlier maturity (Blanchard, Lippa 2007, Iemmola, Ciani 2009).

In this paper we will examine possible evolutionary explanations of homosexual and homoerotic activities in the context of homosociality, i.e., male-male or female-female social relationships in the broadest sense (Flood 2008). The first theory suggests that an opportunistic homosexuality is adaptive and the second one considers homosexual preferences as a by-product of another adaptation. Moreover, we will discuss these theories in the light of more recent theoretical frameworks and empirical evidence, and suggest further directions to consider these theories.

## ADAPTIVENESS OF HOMOSEXUAL BEHAVIOUR

According to a theory proposed by Kirkpatrick (2000), stable homosexual orientation evolved from occasional homosexual behaviour which served to reinforce and maintain same-sex alliances. This theory states that homosexual behaviour derives from selection for reciprocal altruism, which contributed to reduction of inter-male aggression and increase exchange of resources. Homosexual behaviour is therefore not a reproductive strategy but rather a survival strategy and can be explained similarly as the costs and benefits in the context of reciprocal altruism (Kirkpatrick 2000). The reciprocal altruism is a model of behaviour when an organism acts in a manner that temporarily reduces its own fitness and increases another organism's fitness, with the expectation that the other organism will act similarly in future (Trivers 1971). For example, in many non-human primates homosexual behaviour is part of a complex network of reciprocal exchange. Homosexual alliances have been documented for example in macaques (Vasey 1997), bonobos (Hohmann, Fruth 2000), or gorillas (Robbins *et al.* 2004). In these species, homosexual behaviour or homoerotic activities (i.e., same-sex sexual behaviour that involves genital or other sexual contact that is experienced as pleasurable, see, Muscarella 2000) might be explained similarly to social grooming which is important in highly social species

where males live in groups and share a territory (for a review of similar functions of homosexual behaviour in non-human primates, see, Sommer, Vasey 2006, Vasey 2002). Social grooming is a widespread activity in the whole array of animal species in which individuals maintain and clean one another's body. In primates, including humans, social grooming is a major social activity and plays an extremely important role in social bonding. Through social grooming animals may create relationships, bonds and reinforce social structures and family links. Social grooming is also used as a form of reconciliation after conflicts (Dunbar 2009). Thus, homosexual and homoerotic (as well as heterosexual and heteroerotic) behaviour might have similar function in creating and reinforcing social relationships as social grooming.

This theory is based on the following three predictions:

***1. Same-sex alliances help individuals to survive and subsequently reproduce***

Same-sex alliances must have had some reproductive advantages, for example they helped individuals to gain some benefits from an already established family of household, which in turn helps, which in turn helps the potential offspring to survive and reproduce. Thus, individuals who are involved in same-sex alliances enjoy certain benefits, such as increase in social hierarchy which might positively affect their reproductive success.

Muscarella (2000) has suggested that young adult and adolescent hominids were socially peripheralised in same-sex groups, similarly as it has been shown in other primate species. Same sex alliances increased their chances of survival through resource sharing and reciprocal defense against predators and higher status conspecifics. It is assumed that same-sex alliances might have helped individuals to climb the social hierarchy, giving them access to reproductive opportunities or provide access to food (Muscarella *et al.* 2001). This suggestion is supported by evidence from some tribes in Melanesia, for example, where same-sex alliances are based on age stratification. In particular, younger men provide sexual services, while older men provide them with food (Herdt 1993). In this sense, same-sex alliances serve similar function as mixed-sex alliances.

***2. Homosexual behaviour helps in the formation of alliances***

Based on this theory, same-sex alliances, as well as mixed-sex alliances, are positively supported by sexual behaviour. In other words, just as heterosexual behaviour

has its non-reproductive function, which, among others, increase cohesion within the dyad, homosexual behaviour serves to strengthen the bonds within the alliance, and might thus indirectly also enhance the individual reproductive success. In heterosexual relationships this has been supported by studies showing that sexual satisfaction is associated with relationship satisfaction of the couple (Byers 1999, Edwards, Booth 1994). Satisfaction of the couple in turn prolongs duration of the relationship which is supposed to provide optimal environment for offspring's survival and subsequent reproduction (Salmon, Shackelford 2011).

It is worth pointing out that same-sex alliances can be formed without any sexual behaviour – frequently, we find same-sex alliances which are not based on sexual behaviour among their members (for example, marriages between women in the Lovedu, the Venda, the Zulu, and the Tonga, where rich women could acquire wives of their own which allowed them to free themselves from domestic duties) (Weir 2006). Nevertheless, homosexual or homoerotic behaviour is frequently an important part of same-sex alliances.

Along with the role of homosexual and homoerotic activities to serve male-male or female-female bonding within the same-sex alliances, the sexual relationships might establish reciprocity among biologically non-related individuals. In general, there are various ways how to establish kinship-like relationships among non-related individuals, such as various forms of fosterage, adoption, or other ways through which adults assume parental or grandparental roles (Howell 2009). Homosexual and homoerotic behaviour might be considered one of such ways how to create kinship-like bonds among non-related individuals. Thus, through homoerotic rituals, such as in Melanesia, men create a "ritual brotherhood", in which similar rights, and duties as in a family are established. Thank to these rules, interpersonal relationships appear. Examples of such kinship-like alliances can be found not only in traditional societies, but also in post-modern societies, such as in gangs (Vigil 1988) or in military organisations (McCauley 2002).

From the ethological perspective, kinship-like same-sex alliances are supposed to reduce aggressiveness and at the same time strengthen cooperation among its members. Homoerotic behaviour might thus serve as ritualised aggressiveness where active (insertive) individual is supposed to stay higher in the social hierarchy, while the passive (insertee) is supposed to be rather a lower-ranked or submissive individual. For example, male baboons *pretending* to be females lessen

aggression by displaying a submissive, receptive position (Karlen 1971). This is supported by anthropological literature showing that in many societies (in particular in current Latin America, but also in 17<sup>th</sup>-century Japan and China) the individual who is passive in same-sex activities is considered inferior in relation to the active individual (Cardoso 2005, Nesvig 2001). Thus thanks to clarification of hierarchical positions through sexual behaviour there is no need for aggressive behaviour, and (homo)sexual behaviour in such cases might be understood as part of agonistic behaviour.

**3. Occasional bisexual behaviour is more common than exclusive homosexual orientation (The implicit assumption of this hypothesis is that bisexual behaviour is the behaviour to be explained)**

The last point suggested by this theory is that bisexual behaviour is more prevalent than exclusive homosexuality. This is supported by a number of studies from different cultures (for example, various tribes in Melanesia, Herdt 1997) and different historical periods (for example, ancient Greece and Rome) (Dover 1989). In line with this assumption, in many societies including the Western one people behave homosexually at some particular stage of life (e.g., adolescence) and later move on to rather exclusive heterosexuality (Herbenick *et al.*, 2010). This may be due to the fact that same-sex alliances that are not aimed at reproducing and are rather physical (i.e., based only on sexual satisfaction) are more important in early adolescence (Turner *et al.* 1998) (for example initiation rituals in Sambia people, see below), while female-male alliances which focused on sexual reproduction are important later. In addition, in some societies (for instance, in 17<sup>th</sup>-century China) homosexual behaviour is tolerated only when reproductive duties are fulfilled (Eskridge 1993).

Same-sex alliances connected with homosexual behaviour might appear only as a transitional period as a part of a common enculturation process. For example, in Sambia people in New Guinea same-sex sexual activities among young boys and older men are part of the initiation rituals. These rituals might continue into adulthood until the boy marries (which is usually many years later). Interestingly, in this society homosexual behaviour is not understood as a display of homosexual preferences but rather the opposite – homosexual behaviour serves the boy to develop into an adult masculine man who is then able to get married and have a family. Importantly, continuous homosexual behaviour or preferences are a taboo (Herdt 1982, 1987, 1997).

The question is whether bisexual behaviour is more common than exclusive homosexuality when

considering representative sample of population. National representative sample based study of sexual behaviour among males and females in the USA from 2002 showed that among men 90% described themselves as heterosexual, 2.3% as homosexual, only 1.8% as bisexual, and 3.9% as something else, while 1.8% did not report their orientation. Among women 90% described themselves as heterosexual, 1.3% as homosexual, 2.8% as bisexual, 3.8% as something else, and 1.8% did not report their orientation (Mosher *et al.* 2005). In this study, 49% men who reported sexual contact with another male identified themselves as heterosexual and 65% women who have had sexual contact with another woman described themselves as heterosexual. A recent study from the USA showed that men reported homosexual orientation in 4.2% and bisexuality in 2.6% of cases and women considered themselves as gay in 0.9% and in 3.6% as bisexual (Herbenick *et al.* 2010). It thus seems that men less commonly report bisexual orientation than homosexual orientation. Based on these studies higher prevalence of bisexuality is not supported in men, but rather in women. Indeed, in a relatively recent national survey from USA was found that there are more bisexual women than exclusively homosexual ones (Rodríguez Rust 2002).

The issue of bisexuality prevalence has been further addressed by a few recent studies investigating sexual arousal patterns of homosexual, heterosexual, and bisexual individuals. It has been shown that when measuring sexual arousal to different sexual stimuli, physiological reactions do correspond to self-reported sexual arousal, and also orientation, but only in men. Thus, in men sexual arousal was assumed to be a reliable indicator of both self-reported sexual arousal and self-reported sexual orientation (Chivers *et al.* 2004). This study showed a fundamental sex difference in the distribution of sexual orientation consisting of dimensional and categorical distribution of sexual orientation in females and males, respectively. These results called the presupposed sexual orientation continuum into question by showing that sexual arousal in men is rather a dichotomous variable (i.e., the more man is attracted to women, the less he is attracted to men, and vice versa), and in women the continual approach to sexual orientation has rather been supported.

In the following study, the category of male bisexuality was further challenged as it was shown that most men who identified as bisexual showed a homosexual arousal pattern rather than a bisexual one (Rieger *et al.* 2005). However, a recent study using a different sampling method showed that bisexually-

identified men (recruited via internet sites aimed at bisexual rather than homosexual men) indeed have a bisexual pattern of arousal compared with the arousal patterns of men who identify themselves as heterosexual or homosexual (Rosenthal *et al.* 2011). Another recent study showed that self-reported sexual orientation of men and women corresponded with pupil dilation. Among men pupil dilation response to both male and female stimuli was most common in bisexually-identified men. Interestingly, among women pupil dilation as a reaction to both sexes was most common in women who described themselves as heterosexual (Rieger, Savin-Williams 2012). These studies show that a bisexual pattern exists in both men and women, although bisexuality (or, rather, a less-specified sexual preference) might be more common in women.

Female sexuality in general is considered as more flexible and fluid than male sexuality (Baumeister 2000). According to the theory and empirical evidence of psychologist Lisa M. Diamond (2007, 2008a, 2008b, 2011, 2012), female sexual preferences might fluctuate during their lifetime and female orientation is thus considered as more flexible rather than a stable and fixed trait. The author of this theory presents a dynamic model of female sexuality which includes the stability and variability of sexual preferences and compares it to the waveform. Female sexual orientation should therefore not be considered as a stable life-long sexual orientation but rather as a preference which can fluctuate over time and it should be assessed for the studied time period. Unlike most men many women are characterised by "non-exclusive" preference which freely oscillates from heterosexual to homosexual and is also affected by the context of specific life situations (Diamond 2012). It is also remarkable that sexual preference not only changes during years but the change also depends on the fluctuating levels of estrogen across the menstrual cycle. Women who identified themselves as lesbian reported a significant increase in their motivation to act on same-sex desires when estrogen levels were highest and this increase was larger than that observed among bisexual women or among women who had changed their bisexual or lesbian identities to heterosexual or unlabelled identities since the beginning of the study (Diamond, Wallen 2011). Thus, we might speculate that same-sex sexuality might appear in such periods during one's life when same-sex alliances would be advantageous for the individuals (see, Discussion). Theory of female sexual flexibility thus indirectly supports Kirkpatrick's theory of same-sex sexuality as a component of same-sex alliances.

From a different perspective, a recent study supports the assumption of a higher bisexual prevalence by showing that merely a "potential for homosexual response" has a strong hereditary component, although it only partially overlaps with actual homosexual behaviour (Santtila *et al.* 2008). The potential for homosexual response implies a tendency to create same-sex relationships (emotional or sexual), but such relationships do not need to have any impact on self-identified sexual orientation or general preferences of the individual. Thus, a tendency to have same-sex partners might have even a stronger genetic component than overt homosexual behaviour or homosexual identification. So, it seems that most advantageous sexual orientation could be bisexuality because in such sexuality the advantages of homosocial bonding (Gutmann 1997) and reproduction are working in concert (Kirkpatrick 2000). It is worth pointing out that this study partly contradicts the above mentioned studies based on identification with bisexual orientation because the potential for homosexual response only partly overlaps with self-reported sexual orientation.

## **HOMOSEXUALITY AS A BY-PRODUCT**

Based on some theories (e.g., McKnight 1997, Miller 2000, Rahman, Wilson 2003), homosexuality might be a by-product of another adaptation which brings some benefits for the individual who is not homosexual but carries the same genetic component. In other words, the genetic component that influences homosexual orientation is in its heterozygous form advantageous enough to outbalance a rare disadvantage of a homozygous form which displays in the form of homosexuality. The genetic component of homosexuality can be thus maintained in the population, although in homozygous form it is not adaptive. The question was, what is so advantageous about a heterozygous form of a genetic component which affects sexual orientation. Based on gene pleiotropy, it has been suggested that advantageous traits which are influenced by the same genetic component as sexual orientation, might be lower aggressiveness in men or a higher sexual drive (McKnight 1997). This theory has been set into a more general evolutionary framework by Rahman and Wilson (2003). Their theory is built on inter-sexual selection. Basically, their idea lies in reduction of intra-sex aggressiveness which ultimately leads to higher survival benefits including lower rates of infanticide. For instance in case of men, less aggressive and more socially skilled

(i.e., for example men higher on loyalty, or kindness), men started to be preferred by women which further reduced the possibility of infanticide. Such men also had better parenting skills and they were more appropriate for committed, long-term relationships. Since all mentioned traits are connected to lower levels of testosterone and are rather female-like it has been suggested that sexual selection led to a general feminisation in men and homosexuality is only an extreme pole of male feminisation. Male feminisation thus led to higher cooperation among men and thus to more frequent same-sex alliances. Therefore, general feminisation of men might have positively affected both male and female reproductive success despite the existence of a small percentage of men who show a significantly reduced reproductive success because of their "exclusive" homosexuality.

According to this presumption, a similar mechanism of sexual selection might have also affected female sexual orientation. Selection for masculine traits in women might have maintained female alliances (with homosexual activity) and also increased female aggression. This greater aggression could have led to greater protection and care of offspring (Rahman, Wilson 2003). Campbell (1999) points out that female aggression is associated with reproductive success because viability of the offspring depended more on maternal rather than paternal investment.

Thus, both the mechanism of sexual selection and balanced heterozygous fitness might have worked in concert. Nevertheless, it is important to point out that sexual orientation is not a simple Mendelian trait, and recently theory of balanced heterozygous fitness has not been supported by a study showing that heterosexual brothers of homosexual men did not have a higher reproductive success (because of their supposed heterozygous advantage) than a control group (Santtila *et al.* 2009). On the other hand, the sexual selection theory has gained at least some support by showing that women prefer some feminine traits in men (e.g., Perrett *et al.* 1998), although male preferences for masculine females have not been supported so far (Fraccaro 2010).

In line with the previously mentioned studies, it has been suggested that the evolutionary disadvantage of a rare existence of exclusive homosexuality is only a negligible by-product of an important adaptation. According to Dewar (2003), exclusive homosexuality is a small fee for a big advantage – adaptation to the agricultural way of life. During the transition from a hunter-gatherer life to an agricultural lifestyle (i.e., the transition from small communities to large and settled

ones), women began to prefer rather feminine characteristics in men such as higher communication and language skills, or lower aggression. In general, these are traits which facilitate life in a larger community. This theory has been criticised because such a complex behavioural trait as homosexuality couldn't probably evolve in less than 15 thousand years. From this theory it can be deduced that in hunter-gatherer societies would be fewer homosexual men than in agricultural societies, and indeed, there is some evidence showing that at least male homosexuality is less frequent in hunter-gatherer societies, and it increases with the size of the communities (Barber 1998). Nevertheless, advantages of same sex behaviour are documented in many other primates and therefore it is probably not an evolutionary novelty. On the other hand, life-long stable homosexual preference is very rare in non-human primates and it is thus not clear why, although occasional homosexual behaviour is to the contrary very common in many species, it has never evolved into a stable homosexual orientation also in other species. In particular, we might expect something similar in species with an elaborate system of male same-sex alliances which occurs commonly in apes and other primate species.

It is also possible that the formation of same-sex alliances maintained through homosexual relations can be dated even earlier, before the agricultural revolution. It has been shown that a significant change in the social organisation probably happened in the early beginning of the development of the genus *Homo* (e.g., Leakey 1995, Plavcan 2012). This theory is based on the correlation of primate social organisation and sexual dimorphism. And that, according to Leakey (1995), is the key difference between the australopithecines and early *Homo*. Relatively little sexual dimorphism in early genus *Homo* was interpreted as a change in social organisation from that one found in *Australopithecus*. Males of early *Homo* probably stayed in their native groups while females move to other groups. The affinity in this group then significantly increases cooperation among males. It is therefore possible that the genetic component related to exclusive homosexuality has evolved since the very beginnings of the genus *Homo*, and not at the time of the Neolithic revolution as Dewar thought.

## CONCLUSION AND PROPOSALS FOR FURTHER INVESTIGATIONS

As we have outlined above, opportunistic homosexuality may be adaptive within certain social

contexts, or in specific periods during individual ontogeny, even if not through direct increase of individual reproductive success. Thus, homosexual behaviour can serve social purposes, such as initiation into adulthood (see above, Herdt 1997), as well as heterosexual behaviour, and might thus be highly adaptive even if it does not lead to reproduction. The motivation for such activities might then be social rather than sexual although the involved individuals can display sexual arousal.

As we have shown, female sexuality is recently considered more flexible and fluid than male sexuality (Diamond 2007, 2008a, 2008b, 2009, 2012) and female sexual preferences might fluctuate during lifetime. In the light of Kirkpatrick's theory we propose that same-sex sexuality and/or preferences can appear at specific periods during individual's ontogeny when same-sex alliances would be advantageous for the individual. We thus predict that changes in female sexual preferences over time may be associated with specific situations where same-sex alliances are more important than a heterosexual relationship. This might be, for example, after a relationship-break up when a woman has young children. For her it might be more advantageous to find a female rather than a male partner. This might be because it has been shown that in families with at least one non-biological parent (i.e., usually the father), the percentage of injuries and deaths of the children rapidly increases in comparison to families with both biological parents (see, e.g., Daly, Wilson 1985). This is interpreted as a consequence of uncertainty of paternity, or rather certainty of non-paternity, which is from the evolutionary point of view disastrous for male reproductive strategies (Salmon, Shackelford 2011). Such same-sex relationship might be advantageous for both partners (the other partner can for instance fulfil her maternal needs which would be directed into the child of the other one), or it can only be advantageous for one of the partners. For example from the ultimate point of view it can only be advantageous for one of the partners, but from the proximal level, intimate relationship with another female can simply fulfil the need for personal proximity or sexual pleasure of the other partner although it does not increase her reproductive success. These hypotheses could be tested through longitudinal studies and by narrative interviews focused on the life circumstances of respondents.

It thus seems that optimal strategy is being opportunistic. If there is a suitable opportunity it does not matter whether the mate is a male or a female because what matters is gaining some benefits (for example resources, territories, child care, or even own

reproductive advantages). Previous research has indirectly supported this theory by showing flexibility of sexual preferences, but rather in females (Diamond 2008a). The issue remains open regarding male bisexuality since we have shown that studies using very different methods usually showed lower percentage of male bisexuals compared to homosexuals. There could be several reasons why male bisexuality is so under-represented.

One of the reasons might be the assessment of sexual orientation. Recent studies have primarily relied on self-reported preferences, feelings, or behaviours. These questionnaire data provide researchers with answers that are in agreement with the degree of how the informant is able to admit his preferences or activities, rather than with actual feelings or preferences. Interestingly, researchers (contrary to clinical sexologists or psychologists) usually do not ask about deep emotional feelings (such as falling in love) when surveying individuals of both sexes, which might uncover preferences that are not even consciously admitted by the respondent. Furthermore, asking about general "attractiveness" or "preferences" does not need to capture erotic seductiveness of the object to the respondent. In particular, we assume that using a semantic differential of "erotically seductive" – "repulsive" objects might localise individual's feelings and preferences toward and also against individuals of the same and opposite sex (or other studied objects and activities) more precisely (Marks, Sartorius 1968). Another way to measure sexual orientation is physiological arousal patterns such as pupil dilations or genital blood perfusion, which might be a more precise measure of sexual preferences.

Finally, and most importantly, we suggest that in line with the theory of homosociality, individuals who perform or have a potential to perform the described opportunistic strategy, the gender of the supposedly preferred individual does not need to be decisive. In other words, if sexual (heterosexual as well as homosexual) behaviour serves a social function for gaining some benefits, or for lowering aggressiveness and clarification of social hierarchy, the activity with the person might be more important than the gender of the person itself. Both, hierarchy and equality of the same-sex alliances might appear, and this might be different for men and women, with men seeking rather a hierarchical position through sexual activities while women more likely are seeking equality with the same-sex partner. We suppose that this might be true in particular in individuals who report some homosexual behaviours or attractions, but they do not label

themselves as homosexuals or bisexuals. However, we are aware that sampling of this kind of people would be probably difficult, but theoretically we could explore visitors in the dark-room in gay bars where people (predominantly men) seek anonymous sexual contacts with individuals of the same sex who do not need to identify themselves as homosexual or bisexual.

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