

## **Biological mechanisms in homosexuality; an update (2007-8).**

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In my main review published in the *Study Guide*, I took pains to emphasise the provisional nature of scientific explanations. What previously seemed like unassailable facts may be challenged or even demolished in the light of new findings. So it is worthwhile briefly reviewing what, if anything, has changed over the past year in the topic under review. My methodology for this update was the same as previously – using the same search terms to hunt for relevant peer-reviewed papers published during the past year (since my previous search was conducted almost exactly one year ago). The same caveats also apply – scientific literature databases do not necessarily give complete coverage of all relevant papers, and related papers which do not happen to use both of the search terms entered will not be picked up. Nevertheless, most papers which explicitly address this topic area should be identified.

**Twin studies.** A recent study by Santtila et al (2008, *Biol Psychol* **77**, 101) examined the potential to engage in homosexual behaviour among a very large sample of twin pairs (both identical MZ and non-identical DZ) in Finland; in total, 6001 female and 3152 male twins were included. Both overt homosexual behaviour (HS – as defined in my main review) and the potential for homosexual response (PHR) were significantly influenced by genetic factors – i.e. MZ twins show significantly higher concordance than DZ twins. The inferred genetic contribution towards PHR is about 37% for males as compared to 46% for females; by contrast, the genetic contribution towards overt HS is around 27% for males but much lower at 16% for females. Only a small proportion of male respondents (3.1%) and even fewer female respondents (1.2%) reported that they had actually engaged in overt HS during the previous 12 months. It is of some interest that PHR seems to be far more widespread than overt HS, suggesting that models predicting widespread bisexuality (BS) in human populations may have some validity. People who would ordinarily identify themselves as heterosexual may nevertheless feel some attraction towards members of the same sex. Needless to say, such ambivalence in regard to sexual attraction must also imply a significant role for choice, which may be influenced in turn by social conventions and personal morality.

**Personality and sexual orientation.** Based on the outcomes of a large BBC internet survey in the UK, Lippa (2008, *Arch Sexual Behav* **37**, 173) examined a variety of personality traits that show clear gender differences. He concluded that most homosexual (and bisexual) men are shifted in a female-typical direction relative to heterosexual men, whereas homosexual women are shifted in a male-typical direction relative to heterosexual women (with bisexual women occupying a more intermediate position). These conclusions mostly confirm intuition – but do provide evidence to back up some of the evolutionary rationales for homosexuality cited in my main review (e.g. Miller, 2000, *Arch Sexual Behav* **29**, 1). In fairness, it should be acknowledged that some authors (e.g. Hyde, 2005, *American Psychologist* **60**, 581) have challenged the currently fashionable notion of profound personality differences between males and females – but since some of these differences still remain significant (however belittled), the inferences drawn in regard to HS above are not substantially undermined.

**Index:ring finger [2D:4D] length ratios.** A recent study of MZ and DZ twins (both male and female) suggests a substantial genetic influence on 2D:4D ratios – with MZ twins showing greater concordance than same-sex DZ twins (Gobrogge et al, 2008, *Arch Sexual Behav* **37**, 112); however, there are also substantial non-shared environmental influences. There are also weak correlations between 2D:4D ratio and certain gender-related personality traits such as aggression and sensation-seeking, both of which are linked to high androgen exposure (Hampson et al, 2008, *Arch Sexual Behav* **37**, 133). Another possible indicator of sexual orientation is fluctuating asymmetry (FA) –

which covers minor asymmetries in bodily and facial structures (ears, eyes, limbs etc) that are normally symmetrical in humans. Evidence reported by Hall & Schaeff (2008, *Arch Sexual Behav* **37**, 158) suggests that higher FA scores correlate with higher scores on the Kinsey scale (where 0 = exclusively heterosexual and 6 = exclusively homosexual). However, the same study notes that 2D:4D ratios are **not** correlated with FA score, even though both are loosely associated with sexual orientation. One way of interpreting this apparent paradox is that reduced foetal exposure to androgens may be linked to feminised 2D:4D ratios and thence to one type of HS, whereas FA is associated with a different type of HS that is not linked to androgens but rather to prenatal stresses. In a separate study, higher FA scores were correlated with higher Kinsey scores and thus with sexual orientation for men only, but this relationship did not hold true for women. In neither group was there any association between sexual orientation and left- or right-handedness (Miller et al, 2008, *Arch Sexual Behav* **37**, 150).

**Prenatal hormone exposure.** Females with classical congenital adrenal hyperplasia (CAH) produce an excess of androgens instead of corticosteroids during foetal life, causing variable degrees of masculinisation that can be corrected through a combination of hormone therapy and surgery. A recent large-scale study of CAH females (including the mildest non-classical form) compared them against non-CAH female relatives (sisters and cousins) as a control group. Overall, most of these women were heterosexual, but the incidence of homosexuality (HS) or bisexuality (BS) increased in line with the level of masculinisation for both classical and non-classical CAH. Thus prenatal masculinisation and male-typical childhood behaviour are correlated (albeit only modestly) with later orientation towards HS or BS, suggesting a possible causal role for prenatal androgen exposure. One particularly important aspect of this study is the indirect inference of a dose-response relationship – i.e. higher androgen levels causing greater masculinisation linked to an increased propensity towards HS or BS (Meyer-Bahlburg et al, 2008, *Arch Sexual Behav* **37**, 85). But even the most masculinised cases of CAH do not **all** become homosexual or bisexual, underlining the importance of other factors.

**Brain anatomy and connectivity.** A very recent paper by Savic and Lindstrom (2008, *Proceedings of the National Academy of Sciences USA*, published online 17/06/2008) has confirmed previous reports that the structure of the male brain is more asymmetric (with a larger right cerebral hemisphere) than that of the female brain, and that there are also differences in functional connectivity between male and female brains. At least in animal models, this asymmetry of male brain is already present at birth, and seems to be linked to prenatal androgen exposure. Using age-matched samples (~30 years old) of male and female homosexuals and heterosexuals (who were also all right-handed), Savic and Lindstrom claim that homosexual males show a more typically female pattern of brain symmetry and connectivity, whereas homosexual females show a more typically male pattern of brain asymmetry and connectivity. If confirmed by further investigation, these findings would suggest that the differences in pheromone responses previously reported by these authors (again comparing both homosexual and heterosexual men and women – see main review) are probably hard-wired, reflecting differences in brain structure between heterosexual males and females that appear to be sex-atypical in (some/all?) homosexuals of either gender. However, even ‘hard-wired’ does not necessarily mean immutable, as we have seen in the case of the taxi-drivers whose posterior hippocampus grows larger with increasing expertise in navigation. It would be unwise to claim that this single new study settles the question in favour of homosexuality being innate.

**Conclusions.** These recent contributions to the field tend to reinforce rather than undermine my conclusions from the main review. It is perhaps true that many heterosexual people have vague or occasional homosexual leanings, which can either be expressed (as overt BS) or repressed according to personal moral choice (similar choices exist in regard to adultery for many married heterosexuals). However, it is less clear whether similar freedom of choice pertains in regard to those who would describe themselves as exclusively homosexual.