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Psychoneuroendocrinology 28 (2003) 288–303

www.elsevier.com/locate/psyneuen

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# Sexual orientation and the 2nd to 4th finger length ratio: evidence for organising effects of sex hormones or developmental instability?

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Received 23 November 2001; received in revised form 29 January 2002; accepted 25 February 2002

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## Abstract

It has been proposed that human sexual orientation is influenced by prenatal sex hormones. Some evidence examining putative somatic markers of prenatal sex hormones supports this assumption. An alternative suggestion has been that homosexuality may be due to general developmental disruptions independent of hormonal effects. This study investigated the ratio of the 2nd to 4th finger digits (the 2D:4D ratio), a measure often ascribed to the organisational actions of prenatal androgens, and the fluctuating asymmetry (FA—a measure of general developmental disruption) of these features, in a sample of 240 healthy, right handed and exclusively heterosexual and homosexual males and females ( $N = 60$  per group). Homosexual males and females showed significantly lower 2D:4D ratios in comparison to heterosexuals, but sexual orientation did not relate to any measures of FA. The evidence may suggest that homosexual males and females have been exposed to non-disruptive, but elevated levels of androgens in utero. However, these data also draw attention to difficulties in the interpretation of results when somatic features are employed as biological markers of prenatal hormonal influences. © 2002 Elsevier Science Ltd. All rights reserved.

*Keywords:* Homosexuality; Sex differences; Finger length ratios; Sex hormones; Organising effects; Fluctuating asymmetry

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## 1. Introduction

While there is no single etiogenic theory of sexual orientation, several hypotheses have been proposed which imply that homosexual males and females have been exposed to different prenatal events in comparison to heterosexual males and females. The dominant hypothesis, by far, has arisen from the theory of neurohormonal sexual differentiation, that is the development of physiological and behavioural differences between the two sexes under the control of sex hormones. Thus, homosexuals are considered to follow sex atypical patterns (in the direction of the opposite sex) of development in neurobehavioural domains comparable to, or as a 'by-product' of, the 'atypical' shift in their partner preferences (Ellis and Ames, 1987). An array of evidence has been provided to suggest that, physically and behaviourally, homosexuals follow gender atypical patterns. However, this evidence is riddled with inconsistencies.

Briefly, in behavioural domains homosexual males and females report gender atypical childhood play interests and adult psychological gender (indexed by traditional measures of masculinity—femininity and occupational interests: Bailey and Zucker, 1995; Lippa and Arad, 1997). In fact, this is one of the few findings that have achieved a high degree of replicability, leading some to argue that these are among the strongest associations between childhood and adult behaviour in developmental and sexual orientation research (Hamer and Copeland, 1994). Amongst more contentious areas of investigation, homosexual males sometimes show a profile of cognitive abilities more typical of heterosexual women (for example, poorer performance on tests of spatial processing and superior verbal skills; McCormick and Witelson, 1991; Sanders and Wright, 1997; Wegesin, 1998). Two further studies failed to replicate these patterns, finding instead that homosexual males did not differ significantly from heterosexual males in sex dimorphic cognitive functions (Tuttle and Pillard, 1991; Gladue and Bailey, 1995). Physically, homosexuals are reported to show opposite sex patterns of height and weight, and homosexual men report earlier pubertal onset compared to heterosexual men (Bogaert and Blanchard, 1996; Bogaert, 1998). These studies rely on archives of the Kinsey Institute for Sex and Reproduction conducted between the 1940s and 1960s rather than current population based estimates.

Already, we are seeing evidence of inconsistency and what some have called the 'file drawer problem' in sex-related research (Maccoby and Jacklin, 1974). That is, the tendency to publish studies using small samples when differences are found, and not to publish when they are null findings or counter to prediction. This has been particularly evident in studies concerning sexual orientation related differences in cognitive function ( $N$ 's ranging from 13 to 32 subjects per groups). This trend is increasingly being addressed with publication of rigorous and larger investigations reporting no differences (Slabbekoorn et al., 2000). Larger samples are needed to confirm that real effects exist, if indeed they do. A further problem, particularly with sexual orientation research, is volunteer bias, which is the tendency for subjects to self-select to take part in investigations. This can lead to the sample being unrepresentative in many important respects. For example, those homosexuals who volunteer

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