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Second-to-fourth digit ratio related to Verbal and Numerical Intelligence and the Big Five

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Abstract

Androgens influence individual differences in a predictable way: they “masculinise” people. The ratio of index finger length to ring finger length (2D:4D) is an index of prenatal androgen exposure. We related 2D:4D to Verbal Intelligence, Numerical Intelligence and the Big Five personality dimensions in a Dutch sample of 44 men and 37 women. We found a relation between right-hand 2D:4D and Verbal and Numerical Intelligence as well as Agreeableness (R^2 's around .22), in a typical masculine pattern (low 2D:4D, low verbal intelligence, high numerical intelligence, and low agreeableness). We conclude 2D:4D is a valuable tool in the study of the determinants of individual differences.

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1. Introduction

The ratio of index finger to ring finger length (2D:4D) is an index of prenatal exposure to testosterone and estrogen (Lutchmaya, Baron-Cohen, Raggatt, Knickmeyer, & Manning, 2004;

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Manning, 2002). High levels of prenatal testosterone and low levels of prenatal estrogens are associated with a low 2D:4D ratio, and men usually have a lower 2D:4D ratio than women (Manning, 2002). Prenatal testosterone masculinises the brain, resulting, among other things, in higher spatial ability (Csatho et al., 2003b), higher musicality (Sluming & Manning, 2000), proneness to immune system and heart diseases (Manning & Bundred, 2000; Manning, Callow, & Bundred, 2003; Manning, Henzi, & Bundred, 2001), depression and autism in men (Manning, Baron-Cohen, Wheelwright, & Sanders, 2001; Martin, Manning, & Dowrick, 1999) and it is related to sexual orientation (Csatho et al., 2003a; Hall & Love, 2003; Lippa, 2003; Manning & Robinson, 2003; Rahman & Wilson, 2003; Williams et al., 2000).

In a recent critical overview by Putz, Gaulin, Sporter, and McBurney (2004), the use of 2D:4D as an index of prenatal influence of testosterone is questioned. Putz and colleagues point to the fact that most positive results, with the exception of sexual orientation, come from a single laboratory, that results are equivocal and sometimes contradictory, that the research designs that are used are prone to finding spurious results, and that the samples are usually either exclusively male or female or pre-selected (e.g., visitors of a fertility clinic, undergraduate psychology students). To make this point empirically, they tested 57 correlations, and showed that 2D:4D correlated significantly in the predicted direction only with sexual orientation (for both sexes) and only for left 2D:4D. They propose that 2D:4D may be an index of prenatal testosterone exposure, but that prenatal testosterone has different effects on the two genders, on different traits or individuals, because androgens fluctuate during development and dimorphic traits differentiate at different times.

If this is the case, it may be that broad dispositions like Intelligence or the Big Five personality dimensions, of which the development most likely is not limited to short periods of time during pregnancy, do show reliable relations with 2D:4D. Surprisingly, to our knowledge no research has assessed the relation of verbal and numerical intelligence with 2D:4D. With regard to intelligence, one would expect that high prenatal testosterone (low 2D:4D) causes a masculine pattern: higher numerical skills, but lower verbal skills (see Jensen, 1998). Indeed, Putz et al. (2004) reported in their overview one study that found a correlation between verbal fluency, an index of verbal intelligence, and 2D:4D, but only in men. Three of the reviewed studies yielded non-significant results. No data are available for numerical skills. With regard to personality, one would also predict high prenatal testosterone (low 2D:4D) causes a masculine pattern. Universally, women report themselves to be higher in Neuroticism, Agreeableness, Warmth, and Openness to Feelings, whereas men report themselves to be higher in Assertiveness and Openness to Ideas (Costa, Terracciano, & McCrae, 2001), and at least some part of these gender differences may be explained by differences in prenatal testosterone, and thus be related to 2D:4D within men and women. Fink, Manning, and Neave (2004), using a student sample from Austria and the UK, found a positive correlation between right-hand 2D:4D ratio and Emotional Stability, and a negative correlation between right-hand 2D:4D and Agreeableness. Both correlations were statistically significant only for women. Austin, Manning, McInroy, and Mathews (2002) found comparable correlations for Emotional Stability, again only in women.

In this study we related numerical and verbal intelligence and the Big Five to left and right-hand 2D:4D. To overcome sample problems of many earlier studies, we used a broad-population sample. We tested the following hypotheses:

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