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Directional asymmetry (right–left differences) in digit ratio (2D:4D) predict indirect aggression in women

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Abstract

A large body of research has revealed that digit length ratios (2D:4D) are influenced by exposure to prenatal androgens. It is thought that higher exposure to prenatal androgens leads to the development of more masculinized (smaller) digit ratios. Low 2D:4D, particularly low right 2D:4D and low right–left 2D:4D (directional asymmetry or DA) has been linked with a number of behavioral traits which are sex-dependent, including performance in sports and exercise, and to some degree, aggression. To date, the focus of digit ratio research has been on physical aggression, however, 2D:4D has never been linked with indirect aggression (also called social or relational aggression), a form of aggression often preferred by women. We measured the 2D:4D of 100 women and compared these scores with responses on indirect and direct aggression questionnaires. Although 2D:4D was not linked to direct aggression in women, we found that low DA predicted indirect aggression. We conclude that higher levels of prenatal testosterone induce higher levels of aggression, and that the link between prenatal testosterone and aggression in women is most strongly seen for indirect aggression.

Keywords: Indirect aggression; Relational aggression; Social aggression; Testosterone; Digit ratio; 2D:4D; Directional asymmetry; DA

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1. Introduction

The ratio of the length of the 2nd (index) and 4th (ring) fingers (digit ratio or 2D:4D) may be negatively correlated with prenatal testosterone (PT). Thus, 2D:4D is sexually dimorphic (with lower values in males compared to females) in children and adults (Manning, Scutt, Wilson, & Lewis-Jones, 1998). This dimorphism appears in the fetus (Malas, Dogan, Hilal Evcil, & Desdicioglu, 2006), and is little affected by puberty (McIntyre, Ellison, Lieberman, Demerath, & Towne, 2005; Trivers, Manning, & Jacobsen, 2006). Prenatal testosterone may be causal for the sexual dimorphism because (i) children with congenital adrenal hyperplasia (CAH), a trait associated with high prenatal androgen, have lower 2D:4D than controls (Brown, Hines, Fane, & Breedlove, 2002; Okten, Kalyoncu, & Yaris, 2002; but see Buck, Williams, Hughes, & Acerini, 2003); (ii) females with CAH often show ovarian hyperandrogenism which has similarities to polycystic ovary syndrome (PCOS) and patients with PCOS have lower 2D:4D than controls (Cattrall, Vollenhoven, & Weston, 2005); (iii) analyses of routine amniocentesis samples show a negative relationship between testosterone:oestrogen ratios and 2D:4D of children (Lutchmaya, Baron-Cohen, Raggatt, Knickmeyer, & Manning, 2004); (iv) maternal smoking during pregnancy elevates PT and is associated with a reduction in children's 2D:4D (Rizwan, Manning, & Brabin, 2006).

The tendency for males to show more physical aggression than females is one of the most well established sex differences in the psychological literature (e.g. Buss, 1961). The link between testosterone and aggression is also well established, although, there is some debate surrounding the strength of the association (e.g. Archer, 2006; Hines, 2004).

To our knowledge, only three studies have examined the link between aggression and digit ratio. Austin, Manning, McInroy, and Mathews (2002) considered whether digit ratio correlated with various subscales on Buss and Perry's (1992) aggression questionnaire. This questionnaire involves four subscales, namely, anger, hostility, verbal aggression, and physical aggression. Austin et al. (2002) found that digit ratio was not linked with any of the aggression subscales for men or women, meaning that prenatal testosterone may not have an influence on aggression.

Bailey and Hurd (2005) attempted to replicate Austin et al.'s (2002) findings, also using Buss and Perry's (1992) aggression questionnaire. They confirmed Austin et al.'s (2002) results with women, finding no relationship between aggression and digit ratio. This was not surprising, given the low rate at which women physically aggress. However, they did find that digit ratio predicted physical aggression (but not other subscales) for men. Specifically, those men with more masculinized digit ratios (and therefore exposed to higher levels of prenatal testosterone) reported being more physically aggressive than other men. As a whole, Bailey and Hurd's (2005) results are consistent with the view that testosterone has an organizational influence on physical aggression in men.

Benderlioglu and Nelson (2004) also examined the link between digit ratio and aggression, however, they focussed on *reactive aggression* a type of aggression that involves an angry outburst to frustration or provocation. Unlike *proactive aggression*, reactive aggression is not pre-meditated, rather it is an immediate response to something unpleasant. To induce aggression, participants were asked to raise money for a fictitious charity organization. They made several calls to confederates of the experiment who were either kind, but not willing to donate, or hostile. Reactive aggression was measured by how forceful participants put down the telephone, and the tone of a prepared follow-up letter to the confederate. Results revealed that digit ratio was related