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Personality and Individual Differences 41 (2006) 1253–1262
PERSONALITY AND INDIVIDUAL DIFFERENCES
www.elsevier.com/locate/paid

Second to fourth digit ratio and sensation seeking

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Available online 21 June 2006

Abstract

Sensation seeking has been described as a trait referring to the tendency to seek novel, varied, complex, and intense sensations and experiences; and the willingness to take risks for the sake of such experiences. Explanations for sensation seeking have been based upon genetic, evolutionary, psychophysiological, and sociocultural models. This study further examines the possibility that prenatal hormones – as measured via 2D:4D finger length ratio – may influence the development of certain personality characteristics associated with sensation seeking (Austin, Manning, McInroy, & Mathews, 2002). We studied the relationship between 2D:4D ratios, a supposed proxy for prenatal testosterone (T), and sensation seeking as assessed by the Sensation Seeking Scale Form V (SSS-V) in a sample of 278 German and UK University students. There were significant sex differences for 2D:4D and on the SSS-V, with males having lower 2D:4D ratios, but higher SSS-V scores. Furthermore, right- and left-hand 2D:4D in males was significantly negatively associated with total sensation seeking score, and the boredom subscale. No significant associations were found for women. Since low 2D:4D is supposed to indicate exposure to higher levels of T *in utero*, our data suggest that there may be an organizational effect of T which influences later development of sensation seeking personality characteristics in men.

Keywords: Digit ratio; Personality; Sensation seeking; Sex differences; Testosterone

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doi:10.1016/j.paid.2006.05.002

1. Introduction

There is evidence that the ratio between the second and fourth finger lengths (2D:4D) is a sexually dimorphic trait, with mean values being lower for males than for females (George, 1930; Manning et al., 2000; Manning, Scutt, Wilson, & Lewis-Jones, 1998; Phelps, 1952). Such differences have been reported in children as young as two years old (Manning et al., 1998) and sexual dimorphism in 2D:4D has also been noted in other species (Brown, Finn, & Breedlove, 2002a; Burley & Foster, 2004; McFadden & Bracht, 2005). It has been suggested that this physical dimorphism is determined *in utero* by about the 14th week of gestation (Manning et al., 1998; see also Phelps, 1952; Garn, Burdi, Babler, & Stinson, 1975) and may be influenced by, and thus reflect, the prenatal hormonal environment. In particular, it is thought that a high testosterone/estrogen (T/E) ratio produces a low (male-typical) 2D:4D, while a high E/T ratio produces a high (female-typical) 2D:4D (Manning, 2002; Manning et al., 1998).

Evidence that 2D:4D acts as a marker for prenatal hormone exposure and sensitivity is currently mainly based upon associations with characteristics, which are themselves dependent on sex steroids. This includes correlations between 2D:4D and physical characteristics (Fink et al., 2005; Fink, Neave, & Manning, 2003; Manning, Trivers, Singh, & Thornhill, 1999), congenital adrenal hyperplasia (Brown, Hines, Fane, & Breedlove, 2002b), and autism (Manning, Baron-Cohen, Wheelwright, & Sanders, 2001). Consistent with this interpretation, Lutchmaya, Baron-Cohen, Raggatt, Knickmeyer, and Manning (2004) provided direct evidence when they assessed fetal T and E via amniocentesis and found that 2D:4D ratio measured at age 2 was associated with high T in relation to E. The underlying mechanisms for such correlations have been suggested by Manning et al. (1998) to be via the action of the Homeobox (or Hox) genes, which control differentiation of digits, testes, and ovaries (Kondo, Zakany, Innis, & Duboule, 1997). This common control of the differentiation of digits and gonads may allow aspects of gonadal function such as the production of T and E to thus affect the development of the digits.

A primary role of the steroid hormones during early development is the establishment of morphological and neurological sex differences, which provide the foundation for the subsequent observed sex differences in behaviour (Morris, Jordan, & Breedlove, 2004). Sex differentiation of the brain appears to follow a similar pattern to that of morphological features in the way that tissue is masculinized by the presence of T or feminized by its absence (e.g. Collaer & Hines, 1995). There are known to be a number of replicable male-female differences in personality that have been related to sex-steroids. For example, males demonstrate higher scores than females on psychoticism (Eysenck & Eysenck, 1976) and on various aggression scales (Buss & Perry, 1992; Harris, Rushton, Hampson, & Jackson, 1996). Negative associations between circulating T levels and neuroticism have been found in males (Dabbs, Hopper, & Jurkovic, 1990). Further, males engage in greater risk-taking and sensation seeking (Jackson, 1967; Zuckerman, Eysenck, & Eysenck, 1978) and positive associations between sensation seeking scores and circulating T levels have also been reported for males (Daitzman & Zuckerman, 1980; Daitzman, Zuckerman, Sammelwitz, & Ganjam, 1978; Gerra et al., 1999). Females have been found to score higher than males on 'neuroticism' and on various measures of depression (Eysenck & Eysenck, 1976; Hawkins, McDermott, Sheilds, & Harvey, 1989; Sowa & Lustman,