Personality and Individual Differences 135 (2018) 108–112

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Gender differences in the interrelations between digit ratio, psychopathic traits and life history strategies

Vanessa Marchegiani[a], Fabio Zampieri[a], Mila Della Barbera[a], Alfonso Troisi[b,*]

[a] Department of Cardiac, Thoracic and Vascular Sciences, University of Padua Medical School, Padua, Italy
[b] International Medical School, University of Rome Tor Vergata, Rome, Italy

ARTICLE INFO

Keywords:
Digit ratio
2D:4D
Prenatal sex hormones
Psychopathy
Life history theory
Gender differences

ABSTRACT

The primary purpose of this study was to assess the relationship between prenatal exposure to sex hormones, as measured by digit ratio (2D:4D), and psychopathic personality traits while controlling for the confounding effect of life history strategy. The secondary purpose was to confirm the hypothesis that primary and secondary psychopathy reflect a faster life history strategy. In a nonclinical sample of 137 volunteers, we measured the right and left hand digit ratios, personality traits reflecting primary and secondary psychopathy, and life history strategies. In a hierarchical regression analysis, males with lower levels of prenatal testosterone exposure, as measured by the left hand 2D:4D, scored higher on the subscale measuring primary psychopathy. Neither the right hand 2D:4D nor the left hand 2D:4D were significant predictors of secondary psychopathy. In the female subsample, digit ratios did not correlate with either primary or secondary psychopathy. Males with faster life history strategies scored higher on both primary and secondary psychopathy. By contrast, among the female participants, there was no significant correlation between the life history score and primary psychopathy, and the correlation with secondary psychopathy was significant but relatively weak. These findings suggest that the neurodevelopmental pathways to psychopathy may differ according to sex.

1. Introduction

The classical description of psychopathic personality depicts individuals who are superficially charming but, at the same time, callous, grandiose, guiltless, and who frequently engage in impulsive and reckless acts (Hare, 1993). Karpman (1941) was the first to propose two distinct types of psychopathy. Individuals with primary psychopathy tend to be emotionally stable and low in anxiety, whereas those with secondary psychopathy are emotionally unstable and high in anxiety (Vidal, Skeem, & Camp, 2010). The distinction between primary and secondary psychopathy has been validated by studies focusing on emotional response to aversive stimuli (Kimonis, Fanti, Goulter, & Hall, 2017), neuroendocrine factors ((Kimonis, Goulter, Hawes, Wilbur, & Groer, 2017), shame and guilt proneness (Lyons, 2015), defection on social relationships (Gervais, Kline, Ludmer, George, & Manson, 2013), and behavioral inhibition/activation systems (Newman, MacCoon, Vaughn, & Sadeh, 2005). Attributes of primary psychopathy are thought to be inherited and present at birth whereas secondary psychopathy is thought to have more environmental influences (Waldman & Rhee, 2006). However, recent studies have shown that gene-environment correlations rather than main effects of genes and environments account for the differential environmental correlates of primary and secondary psychopathy (Hicks et al., 2012).

As a cluster of undesirable personality traits, psychopathy was traditionally relegated to clinical research for years. Only recently has the idea that these traits are worth studying in community samples been given serious attention. A major impulse to studies of nonclinical populations was given by taxometric data suggesting that psychopathic traits fall along a continuum and differ from normality in degree rather than kind (Edens, Marcus, Lilienfeld, & Poythress Jr., 2006).

Based on epidemiological data showing a consistent gender difference (i.e., men > women) in the prevalence and severity of psychopathic personality traits (Cale & Lilienfeld, 2002), some researchers have hypothesized that fetal and adult levels of testosterone may play an etiological role in the development of cognitive, emotional and behavioral manifestations of psychopathy (see Yildirim & Derksen, 2012 for review). The relative length of the second and fourth digit (2D:4D or digit ratio) represents an individual difference variable related to prenatal gonadal hormone exposure (e.g., Manning, Kilduff, Cook, Crewther, & Fink, 2014). A lower ratio (smaller 2D than 4D) is indicative of relatively higher prenatal testosterone than estrogen levels. Using 2D:4D as a biomarker for prenatal testosterone exposure, several

* Corresponding author at: Department of Systems Medicine, University of Rome Tor Vergata, via Montpellier 1, 00133 Rome, Italy.
E-mail address: alfonso.troisi@uniroma2.it (A. Troisi).

https://doi.org/10.1016/j.paid.2018.07.004
Received 21 May 2018; Received in revised form 5 July 2018; Accepted 5 July 2018

studies have investigated the relationship between digit ratio and psychopathic traits (Blanchard & Lyons, 2010; Blanchard, Lyons, & Centifanti, 2016; Carré et al., 2015) or affective empathy (Kempe & Heffernan, 2011) in nonclinical populations. The results of these studies have been inconsistent, suggesting that a number of confounding variables are likely to modulate the relationship between prenatal testosterone exposure and psychopathy.

A possible confounding variable is life history strategy. Life history theory is a mid-level evolutionary framework that explains individual differences in various correlated behaviors and outcomes such as mating strategies, risky behaviors, reproductive development, and health. These phenotypic variables are conceptualized as indicators of individual differences along a fast-slow life history continuum. Individuals adopting a fast strategy (that theoretically is most adaptive under harsh and unpredictable environmental conditions) employ short-term mating tactics, engage in risky behaviors, are less future oriented, and devote less time to their offspring (Chua, Lukaszewski, Grant, & Sng, 2017; Strouts, Brase, & Dillon, 2017). From an evolutionary perspective, individual differences in psychopathic personality traits may reflect individual differences in life history strategies. Psychopathic traits have been conceived of as personality indicators of a faster life strategy as evidenced through diminished self-control, a short-term mating disposition, selfishness, and other manifestations of antisociality (Jonason, Koenig, & Tost, 2010; Mealey, 1995).

The primary purpose of this study was to assess the relationship between prenatal exposure to sex hormones, as measured by digit ratio, and psychopathic personality traits while controlling for the confounding effect of life history strategy. In addition, in light of previous mixed findings, the secondary purpose of this study was to confirm the hypothesis that primary and secondary psychopathy reflect a faster life history strategy. A key methodological feature of this study was the use of a psychometric scale that distinguishes between primary and secondary psychopathy.

2. Material and methods

2.1. Participants

Participants were 137 young (20.39 ± 3.14 years) volunteers, 65 males and 72 females, enrolled among the staff of the University of Padua Policlinic Hospital and the undergraduate students of the University of Padua Medical School. Based on their self-reports, they were all Caucasian. The research protocol was approved by the ethical committee of the recruiting University. Participants were given verbal and written explanations of the study. Signed consent forms were obtained from each subject before participation.

2.2. Digit ratio

The level of prenatal exposure to sex hormones was measured by digit ratio 2D:4D evaluated separately for the right hand and the left hand through digital morphometric analysis, using the image analysis software Image PRO-Plus 5.1 (Media Cybernetics, Silver Spring, MA, USA). Hands completely elongated were placed lightly on the surface of a flatbed scanner. Using the modality measurement/length, the length in pixel of 2D and 4D was calculated automatically starting from the metacarpophalangeal cutaneous fold to the extremity of the finger. Every digit was measured twice and the average was taken. The software allows measurements extremely precise from the macroscopic to the microscopic scale. Compared to physical measurements, photocopies, and printed scans, computer-assisted measurement of digit ratio yields the most accurate and reliable data (Allaway, Bloski, Pierson, & Lujan, 2009). Participants with a history of injury or illness affecting the hands or fingers were excluded.

2.3. Psychometric assessment

The Levenson Self-Report Psychopathy Scale (LSRP; Levenson, Kiehl, & Fitzpatrick, 1995) is a 26-item self-report measure designed to assess psychopathic personality traits in noncriminal populations. Using a Likert-style format, item responses range from 1 (“strongly disagree”) to 4 (“strongly agree”). Seven items are reverse-scored to control for response style and social desirability. Two correlated subscales have been derived from factor analyses. The 16-item Primary Psychopathy (LSRP-PP) scale was designed to assess a callous and unemotional personality style and a tendency to manipulate others (e.g., “Success is based on the survival of the fittest; I am not concerned about the losers”). The 10-item Secondary Psychopathy (LSRP-SP) scale was designed to assess impulsive antisociality (e.g., “When I get in trouble, I often ‘let off steam’ by blowing my top”). Past research has provided evidence for the reliability and discriminant validity of the LSRP (Brinkley, Schmitt, Smith, & Newman, 2001).

The Mini-*K* is the most widely utilized self-report life history assessment currently used in psychological research. The 20 item self-report questionnaire measures cognitive and behavioral aspects of an individual's life history strategy and is scored on a 5-point Likert scale (−2 = extremely uncharacteristic of me; +2 = extremely characteristic of me). The scores are summed to produce a total life history score. A positive score is indicative of a slower life strategy and conversely a negative score is indicative of a faster life strategy. The Mini-*K* contains items that tap into developmental experiences, optimism, perseverance, risk-taking, sociosexuality, bidirectional social support with friends and family members, and community and religious involvement. All of these components are thought to reflect life history speed, and the scale predicts theoretically convergent indicators of slow life history strategy assessed with standard longer instruments (Figueredo, Cabeza de Baca, & Woodley, 2013). The Mini-*K* also demonstrates concurrent or predictive validity (Olderbak, Gladden, Wolf, & Figueredo, 2014).

2.4. Statistical analysis

We used the software G*Power 3.1.9.2 for calculating sample size before enrolling participants (Faul, Erdfelder, Buchner, & Lang, 2009). Coefficients of correlation were used to calculate zero-order correlations between variables. Between-group comparisons were made with *t*-test. Hierarchical regression analysis was used to estimate the contribution of prenatal testosterone exposure (as measured by 2D:4D) to primary and secondary psychopathy above and beyond the contribution of age, education and life history strategy. Collinearity diagnostics based on eigenvalues of the scaled and uncentered cross-products matrix, variation inflation factors (VIF) and tolerances for individual variables was used to exclude multicollinearity among the independent variables. Analysis was performed on a personal computer using SPSS for Windows, version 19.0 (SPSS, Inc., Chicago, Ill.).

3. Results

Table 1 reports descriptive data for male and female participants. As expected, males scored significantly higher than females on the primary psychopathy subscale. Males and females did not differ on any other of the recorded variables (i.e., age, education, right hand 2D:4D, left hand 2D:4D, life history scale, secondary psychopathy subscale).

In the entire sample, neither primary psychopathy (LSRP-PP score) nor secondary psychopathy (LSRP-SP score) were correlated with age ($r = -0.15$, NS; $r = -0.18$, NS) or education ($r = -0.14$, NS; $r = -0.16$, NS). Among the male participants, the measure of life history strategy (Mini-*K* score) was strongly correlated with both primary psychopathy ($r = -0.58$, $p < 0.001$) (Fig. 1) and secondary psychopathy ($r = -0.54$, $p < 0.001$) (Fig. 2). Males with Mini-*K* scores reflecting faster life history strategies scored higher on both the subscales of the LRSP. By contrast, among the female participants, there was no