



## Cortisol reactivity to psychosocial stress mediates the relationship between extraversion and unrestricted sociosexuality



M. Claire Wilson<sup>a</sup>, Samuele Zilioli<sup>b</sup>, Davide Ponzi<sup>a</sup>, Andrea Henry<sup>a</sup>, Konrad Kubicki<sup>a</sup>, Nora Nickels<sup>a</sup>, Dario Maestripieri<sup>a,\*</sup>

<sup>a</sup> Institute for Mind and Biology, The University of Chicago, Chicago, United States

<sup>b</sup> Department of Psychology, Wayne State University, Detroit, United States

### ARTICLE INFO

#### Article history:

Received 3 June 2015

Received in revised form 3 July 2015

Accepted 4 July 2015

Available online 16 July 2015

#### Keywords:

Extraversion

Sociosexuality

Stress

Cortisol

Evolution

### ABSTRACT

We investigated the hypotheses that extraversion is associated with unrestricted sociosexuality (operationalized as greater sexual experience and greater short-term mating orientation) and that this association is mediated by reduced cortisol reactivity to psychosocial stress. Study participants were heterosexual male college students ( $n = 109$ ). Extraversion was assessed with the Big Five Inventory and sociosexuality was assessed with the Multidimensional Sociosexuality Orientation Inventory. Cortisol reactivity to psychosocial stress was assessed via three saliva samples collected immediately before, immediately after, and 15 min after the Trier Social Stress Test. Extraversion was associated with greater sexual experience but not with greater short-term mating orientation. As predicted, more extraverted individuals showed a lower increase in cortisol in response to psychosocial stress than less extraverted individuals. Previous sexual experience and short-term mating orientation were negatively correlated with cortisol reactivity to stress. Finally, mediation analyses confirmed our hypothesis that cortisol reactivity to psychosocial stress is a mechanism mediating the association between extraversion and unrestricted sociosexuality. These findings have implications for our understanding of the benefits and costs of different personality traits as well as for our understanding of the determinants or correlates of individual differences in sociosexuality.

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### 1. Introduction

Evolutionary research on human personality has been concentrated in two main areas: the examination of the relative role of genetic polymorphisms and facultative calibration in the maintenance of personality variation in human populations (e.g., [Lukaszewski, 2011](#); [Lukaszewski & von Rueden, 2015](#)), and the study of the functional significance of personality variation to better understand the fitness costs and benefits associated with different personality traits (e.g., [Nettle, 2005](#)). In both areas of research, many studies have focused on extraversion ([Lukaszewski & Roney, 2011](#); [Lukaszewski & von Rueden, 2015](#); [Nettle, 2005](#); [Schmitt, 2004](#); [Schmitt & Shackelford, 2008](#)).

Extraversion is one of the five major dimensions of personality in the Big Five model ([John, Donahue, & Kentle, 1991](#); [McCrae & Costa, 1997](#)). At a general level, extraversion has sometimes been conceptualized as a propensity toward reward-seeking ([Cloninger, Przybeck, & Svrakic, 1991](#)) and has thus been linked to ambition, competitiveness, exploration, and other pleasurable activities ([Nettle, 2005](#)). At the interpersonal level, extraversion is characterized by high levels of social engagement,

surgency, energy, activity, gregariousness, and positive affect ([John et al., 1991](#); [McCrae & Costa, 1997](#)). The interpersonal dimension of extraversion, however, is heterogeneous and includes both a nurturance/love component (expressed for example, in romantic or parent–child relationships) and a reward-seeking component, which leads extraverted individuals to compete for social attention and social success as well as pursue novelty- and sensation-seeking in sexual relationships ([Lukaszewski & von Rueden, 2015](#)).

Extraverted individuals engage in social exchange with a large number of people, therefore potentially benefiting from cooperation but also exposing themselves to social exploitation. In contrast, introverted people are more inclined to invest in a smaller number of deep engagement relationships with close partners, as well as in solitary activities ([Lukaszewski & von Rueden, 2015](#)). Extraversion is also associated with status motivation (e.g., desire for attention, social boldness, assertiveness), while introversion is predictive of higher motivation to follow than to lead ([Lukaszewski & von Rueden, 2015](#)). Extraverted individuals find it easy to interact with strangers and to initiate new relationships; as a result, higher levels of extraversion are linked to greater sexual experience and greater short-term mating orientation ([Jackson & Kirkpatrick, 2007](#); [Nettle, 2005](#); [Randler et al., 2012](#); [Simpson & Gangestad, 1991](#); [Wright & Reise, 1997](#)). Introversion, conversely, relates to greater sexual restraint and lower

\* Corresponding author at: Institute for Mind and Biology, The University of Chicago, 940 E. 57th Street, Chicago, IL 60637, United States.

E-mail address: [dario@uchicago.edu](mailto:dario@uchicago.edu) (D. Maestripieri).

sexual promiscuity (Schmitt, 2004; Schmitt & Buss, 2000; Schmitt & Shackelford, 2008). Although extraversion carries potential benefits in terms of greater short-term mating success, there are costs associated with it in terms of greater expenditure of energy, risk of infectious diseases, relationship instability, and social/environmental instability for children (Nettle, 2005).

Regardless of whether inter-individual variation along the extraversion continuum is primarily the result of genetic polymorphisms or facultative calibration, the association between this personality dimension and sociosexual behavior is unlikely to be direct but rather mediated by psychological, neural, and neuroendocrine mechanisms. In terms of psychological and neural mechanisms, disinhibition, novelty- and sensation-seeking, and the dopaminergic neurons that constitute the reward circuit in the brain are likely to play a role in the sociosexual behavior of extraverted and introverted individuals. Neuroendocrine correlates of extraversion/introversion have not been systematically investigated but the hormones of the hypothalamic–pituitary–adrenal (HPA) axis are likely to be involved.

One key difference between extraverted and introverted individuals is that while the former find social stimuli rewarding, the latter find them aversive or stressful. Activation of stress responses when exposed to novel social stimuli (e.g., interaction with unfamiliar individuals) can dampen the motivation to be socially competitive or to engage in sexual courtship. In addition to detrimental effects on motivation, stress can also impair cognitive processes and interfere with an individual's performance (de Kloet, Oitzl, & Joels, 1999), regardless of whether the context is one of social competition or one of courtship and mate attraction.

Surprisingly, there have been only a few studies examining the relationship between extraversion/introversion and physiological responses to social stress, and the evidence provided by these studies is mixed. In one study, introversion was associated with higher cortisol levels in response to a psychosocial laboratory stressor (the Trier Social Stress Test; Tyrka et al., 2007) but in other studies this was not the case (Oswald et al., 2006; Schommer, Kudielka, Hellhammer, & Kirschbaum, 1999). Previous studies did not address whether some aspects of extraversion were more likely to be associated with cortisol responses to psychosocial stress than others. One study reported that extroverts were more effective at using “challenge” coping to buffer psychological stress, perform well, and maintain positive affect during a speech in front of an audience, but this study did not report any physiological data (Penley & Tomaka, 2002).

## 2. The current study

The present research investigated whether extraversion and sociosexuality are related to, and more specifically mediated by, variability in physiological responses to social evaluative stress among young heterosexual males. First, we hypothesized that extraversion would be positively correlated with greater sexual experience and greater short-term mating orientation. Second, we hypothesized that both extraversion and sociosexuality would vary inversely with hormonal responses to psychosocial stress, such that greater extraversion and unrestricted sociosexuality would be associated with smaller increases in cortisol in response to psychosocial stress. Finally, a statistical mediation analysis was conducted to determine whether physiological reactivity to psychosocial stress may be one of the mechanisms explaining the relationship between extraversion and sociosexuality.

## 3. Methods

### 3.1. Participants

Study participants were 109 heterosexual young men (age range: 18–34 years,  $M = 22.42$ ,  $SD = 3.88$ ) recruited at a private university

through fliers, mailing lists, or a human subject recruitment website (Sona System). The majority of the participants were students. All study participants completed a written informed consent form before participating in the study and were paid \$20 after completion of the procedures. Subject recruitment and data collection lasted approximately 12 months; they were stopped when the desired sample size was reached and there was a sharp decline in response rate to the ads due to the end of the academic year. This study and the use of human subjects were approved by the Social Sciences Institutional Review Board of our institution.

### 3.2. Procedure

On the day of testing, participants were taken to a testing room, where they completed questionnaires for about 25 min, provided a saliva sample, and participated in the Trier Social Stress Test (TSST). Another saliva sample was collected directly after the TSST, followed by 10 min of additional questionnaires and a final saliva sample. Upon completion of all procedures, participants were thanked, debriefed, and given their compensation.

### 3.3. Questionnaires

After completing a brief demographic survey, participants filled out other questionnaires. For the purposes of this study, the following two questionnaires were considered:

**Big Five Inventory (BFI; John et al., 1991):** The BFI is a widely used 44-item measure of the Big Five personality dimensions. Each item asks the respondent to rate on a 5-point Likert scale the extent to which he agrees or disagrees with a statement about his personality (e.g. “I am someone who is talkative”). Average scores were calculated for each of the five dimensions, although the current study considered only scores on the extraversion subscale.

**Multidimensional Sociosexuality Orientation Inventory (MSOI; Jackson & Kirkpatrick, 2007):** The MSOI is a 25-item measure of sociosexual orientation, which includes three subscales: Short-term mating orientation (STMO; 7 items after excluding some questions specific to women's preferences;  $\alpha = .93$ ), Long-term mating orientation (LTMO; 9 items;  $\alpha = .88$ ), and Previous sexual experience (PSE; three items;  $\alpha = .75$ ). Questions included both 7-point Likert-scale attitudinal items (e.g., “I could easily imagine myself enjoying one night of sex with someone I would never see again”) and numerical responses (e.g., “How many partners have you had sexual intercourse with on one and only one occasion?”). For the current study, average scores for each of the three subscales were used.

**Table 1**  
Descriptive statistics.

	M	SEM	SD
Age	22.418	0.388	3.942
Short-term mating orientation	4.502	0.155	1.570
Long-term mating orientation	5.833	0.091	0.925
Previous sexual experience	3.317	0.427	4.333
Extraversion	3.260	0.078	0.790
Pre-TSST cortisol (C0) ( $\mu\text{g}/\text{dL}$ )	0.195	0.010	0.105
First post-TSST cortisol (C1) ( $\mu\text{g}/\text{dL}$ )	0.311	0.016	0.159
Second post-TSST cortisol (C2) ( $\mu\text{g}/\text{dL}$ )	0.388	0.027	0.271

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